

# WELCOME

*Regional Science Consortium  
14<sup>th</sup> Annual Research Symposium  
November 7–9, 2018  
Tom Ridge Environmental Center  
at Presque Isle State Park*

*Welcome*... to the celebration of our 14<sup>th</sup> Annual Regional Science Consortium Research Symposium!

Every year I look forward to the Symposium, and this year was no different. I am excited to report that the next three days will include 36 Oral Presentations and 35 Poster Presentations. The purpose of our Symposium is to provide a venue to present scientific research by our RSC researchers. The Symposium is the one time each year that the scientists and students in this region come together, inform others of their research, and also listen to their colleagues' research; thereby creating a great opportunity for collaboration among scientists from all disciplines, which I believe to be the spirit of the Consortium. We have a great variety of presentations that will interest everyone. Therefore, take the time to listen or view as many presentations as you can... they are impressive this year.

Please visit the Exhibitor Tables found throughout the TREC Visitor's Area, featuring information on some of our partner organizations and academic programs. We encourage everyone to attend our Poster Session on Wednesday evening from 6:00 – 8:00, providing the opportunity to discuss the projects with the poster presenters (*refreshments provided*). Also, there is still time to purchase your ticket for the Dinner on Thursday evening, which includes great food, drinks, silent auction, and the Salmon Frank band. Visit our Registration Table for more details.

I would like to thank all of the participants of the Symposium this year. I would like to thank the researchers, professors, and especially the students for their hard work in preparing their PowerPoint and Poster presentations. I would also like to thank the PA DCNR staff of the TREC and the Sunset Café for the preparations. I would especially like to thank Amber Stilwell, Sean Dalton, Beth McLaughlin, Holly Best, and Jennifer Salem for their support with this event and for the RSC. ***Thank you!***

I hope you all enjoy Symposium 2018!  
Please mark your calendar for next year's Regional Science Consortium Research Symposium on November 6 – 8, 2019.

Cheers!  
*Jeanette*

Jeanette Schnars, Ph.D.  
Executive Director  
Regional Science Consortium

## FACILITIES

*Regional Science Consortium  
14<sup>th</sup> Annual Research Symposium  
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Tom Ridge Environmental Center  
At Presque Isle State Park*

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Welcome back to the Tom Ridge Environmental Center. This year's Research Symposium will be utilizing several areas of the Center. If you have any questions, please do not hesitate to ask at the Registration Table in the lobby.

- TREC Lobby – Registration Table
- Room 112 – Oral Presentations
- Room 110 – Social Area
- Room 108 – Presentation Practice Area
- Second Floor – Poster Presentations
- Second Floor – Exhibitor Tables (around poster area)
- First Floor – Thursday evening Dinner  
Sunset Café – Lunch

## EXHIBITORS

*Regional Science Consortium  
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Please take the time to visit the many Exhibitor Tables throughout the first floor Visitor's Area of the TREC providing you with information on our partner organizations.

- Cleveland Museum of Natural History
- Coastal Zone Management Program
- Creek Connections, Allegheny College
- CRANE – Community Resiliency Action Network of Erie
- Environment Erie
- Erie County Department of Health
- Erie County Department of Planning
- Flagship Niagara League
- Fondriest Environmental
- Gannon University – Environmental Science & Engineering Graduate School
- Go Native Erie!
- Natural History Museum at the Tom Ridge Environmental Center
- PA Department of Conservation and Natural Resources
- PA Sea Grant
- PASST – Pennsylvania Archaeological Shipwreck and Survey Team
- Purple Martin Conservation Association
- SONS of Lake Erie
- Weed Warriors

# SCHEDULE OF TALKS

*Regional Science Consortium  
14<sup>th</sup> Annual Research Symposium  
November 7 - 9, 2018  
Tom Ridge Environmental Center  
at Presque Isle State Park*

**WEDNESDAY, NOVEMBER 7, 2018**

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8:00 – 8:55           **REGISTRATION OPENS**  
                                  Register, upload presentations

8:55 – 9:00           **Welcome**  
                                  Jeanette Schnars, Ph.D., Executive Director, RSC

## **Presentations**

*Session Chair: Jeanette Schnars, RSC Executive Director*

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9:00 – 9:20           **An Epic War: Presque Isle State Park vs. Invasive Plants**  
                                  Holly Best, M.A., Park Manager 3, Presque Isle State Park

9:20 – 9:40           **The Presque Isle Priority Wetland Restoration (PIPWR) project: A  
Comprehensive Survey of Wetland Vegetation**  
                                  Robert S. Whyte, California University of Pennsylvania, Biological and  
                                  Environmental Science Department

9:40 – 10:00       **Four Seasons of Growing: Plant Propagation for Wetland Restoration on  
Presque Isle State Park**  
                                  Jen Salem, Go Native! Erie, Regional Science Consortium

10:00 – 10:20      **Fish and Amphibian Surveys in Restored Priority Wetland Habitats on  
Presque Isle State Park, Erie, PA**  
                                  Sean Dalton\*, Amber Stilwell, Jeanette Schnars, Regional Science  
                                  Consortium

10:20 – 10:40      **Effects of invasive plant control efforts on marsh breeding birds at a  
wetland complex along southern Lake Erie**  
                                  Sarah Sargent\*<sup>1</sup>, Christopher H. Lundberg<sup>2</sup>, and Anne Balogh<sup>3</sup>  
                                  <sup>1</sup>National Audubon Society, Meadville, PA; currently Erie Bird  
                                  Observatory, Erie, PA 16505  
                                  <sup>2</sup>Allegheny College, Department of Biology, Meadville, PA 16335  
                                  <sup>3</sup>Licking County Parks Department, Granville, OH 43023

10:40 – 11:20      **BREAK**

*Session Chair:*

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- 11:20 – 11:40      **Bacterial Communities of Human Remains and Adjacent Soils in Forensic Settings: Applications to Postmortem Interval Estimation**  
Randi Depp, Mercyhurst University
- 11:40 – 12:00      **Estimation of American Black and White Ancestry from Measurements of the Vertebrae and Sacrum**  
Rhiann Dunn\*, Luis Cabo, Mercyhurst University, Department of Applied Forensic Sciences
- 12:00 – 12:20      **Age-at-Death Estimation from the Auricular Surface of the Human: A Comparison of Two Methods**  
Andrea Ost, Mercyhurst University, Department of Applied Forensic Sciences
- 12:20 – 1:20        **LUNCH – THE SUNSET CAFÉ**

*Session Chair:*

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- 1:20 – 1:40        **USEPA Beaches Act: The Regulation and Pennsylvania’s Responsibility Under the Act**  
Chelsey Erickson, Erie County Department of Health
- 1:40 – 2:00        **Monitoring the increasing amount of Small Flow Treatment Facilities (SFTFs) in Erie County**  
Matthew Elwell, Erie County Department of Health
- 2:00 – 2:20        **Researching Stormwater Runoff at the White Township Recreation Complex in Indiana County, Pennsylvania**  
Kayla Kroczyński\*, Katie Farnsworth, Indian University of Pennsylvania
- 2:20 – 2:40        **Occurrence of Pharmaceutical and Personal Care Products in stream (raw) and drinking-water (finished) samples in the Susquehanna and Delaware Watersheds 2007-2009 compared to 2016 and in the Lake Erie Watershed in 2016**  
Joseph Duris, United States Geological Survey
- 2:40 – 3:00        **NOAA’s Focus on Harmful Algal Blooms**  
Sarah Jamison, NOAA National Weather Service
- 4:00 – 6:00        **RSC BOARD MEETING – RSC Board Members**
- 6:00 – 8:00        **POSTER SESSION**

All are welcome to attend – *Refreshments provided*

**THURSDAY, NOVEMBER 8, 2018**

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9:00 – 9:55            **REGISTRATION OPENS**  
Register, upload presentations  
*Continental Breakfast*

9:55 – 10:00        **Welcome**  
Jeanette Schnars, Ph.D., Executive Director, RSC

**Presentations**

***Harmful Algal Bloom Session***  
***Session Chair:***

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10:00 – 10:20        **A Nowcast for *E.coli* and Cyanobacterial Harmful Algal Blooms**  
Joseph Duris\*, Tammy Zimmerman, United States Geological Survey

10:20 – 10:40        **Comparison between cell counts of cyanobacteria and cyanotoxin concentrations using flow cytometry**  
Amber Stilwell\*, Sean Dalton, Jeanette Schnars, Regional Science Consortium

10:40 – 11:00        **Could microbes symbiotic with colonial cyanobacteria in Lake Erie's Presque Isle Bay affect the release of toxins during harmful algae blooms (HABs)?**  
J. Michael Campbell\*, Angelea Belfiore, Mercyhurst University, Biology Department  
Rick Diz, Gannon University, Department of Environmental Engineering

11:00 – 11:20        **Predictive Modeling of Harmful Algal Blooms in Presque Isle Bay, Erie, PA, Using USEPA's Aquatic Ecosystem Model AQUATOX**  
Rick Diz\*<sup>1</sup>, J. Michael Campbell<sup>2</sup>, Mostafa Tahmasebi<sup>1</sup>, Yashaswini Raviillu<sup>1</sup>, Angelea Belfiore<sup>2</sup>  
<sup>1</sup>Gannon University, Department of Environmental Science and Engineering, Erie, PA  
<sup>2</sup>Mercyhurst University, Department of Biology, Erie, PA

11:20 – 12:20        **LUNCH – THE SUNSET CAFÉ**

***Session Chair:***

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12:20 – 12:40        **Temperature and Precipitation Effects on Salamander Migration in Northwestern Pennsylvania**  
Olivia Heeb, Allegheny College

12:40 – 1:00        **Preliminary Limnological Characterization of the Presque Isle State Park Inner Lagoon System**  
Robert S. Whyte\*, California University of Pennsylvania

Jeanette Girosky\*, Tom Ridge Environmental Center and Natural History Museum

1:00 – 1:20      **Range Expansion and Diet Composition of Round Gobies within the French Creek Watershed**  
Casey Bradshaw-Wilson\*<sup>1</sup>, Josh Wisor<sup>2</sup>, Jay Stauffer, Jr.<sup>2</sup>  
<sup>1</sup>Allegheny College, Meadville, PA  
<sup>2</sup>Penn State University, University Park, PA

1:20 – 1:40      **Prevalence of intersex in *Micropterus dolomieu* collected from Presque Isle Bay, Pa and Long Point Bay, Ontario**  
Sean D. Rafferty, Vicki S. Blazer, Heather Walsh, Tom Cermak, Ryan Braham, Jay R. Stauffer, Jr.

1:40 – 2:00      **Acute Decompression Sickness in Yellow Perch**  
Jeanette Schnars, Ph.D., Regional Science Consortium; Charles Murray, PA Fish and Boat Commission; Jay Stauffer, Ph.D., The Penn State University

2:00 – 2:20      **BREAK**

***Session Chair:***

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2:20 – 2:40      **Effects of white-tailed deer on forest understory at Reinstein Woods, College Lodge and Jamestown Audubon nature preserves**  
Ashley Gadzo, Jonathon Titus, Ph.D., SUNY-Fredonia

2:40 – 3:00      **A Census of the Bat Population of Gannon University, Erie, PA**  
Toni Leitshu\*, Alex Stauff\*, and Dr. Steve Ropski, Gannon University, Biology Department, Erie, PA

3:00 – 3:20      **Differentiating between native American bittersweet (*Celastrus scandens* L.) and invasive Oriental bittersweet (*C. orbiculatus* Thunb.) using morphological and germination parameters**  
Connor Mauche, SUNY-Fredonia

3:20 – 3:30      **Shallow Wilderness: Working to Expand Interest in Suburban Ecology**  
Rowan Baxter-Green, Allegheny College  
(*Speed Talk*)

3:30 – 4:00      **Green Building Tour of the Tom Ridge Environmental Center**  
Department of Conservation of Natural Resources

4:00 – 5:00      **Tour of the Regional Science Consortium Research Wing**  
Regional Science Consortium

5:00 – 6:00      **BREAK**

6:00 – 9:00      **DINNER RECEPTION**  
*Food and drinks by the Sunset Café*

*Entertainment by the Salmon Frank Band*  
*Need a ticket? It's not too late! Please see Registration Table*

**FRIDAY, NOVEMBER 9, 2018**

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8:00 – 8:55           **REGISTRATION OPENS**  
*Register, Upload presentations*  
*Continental Breakfast*

8:55 – 9:00           **Welcome**  
Jeanette Schnars, Ph.D., Executive Director, RSC

**Presentations**

***Session Chair:***

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9:00 – 9:20           **The morphology of fear: transgenerational effects of predation risk in freshwater snails**  
Lynne Beaty\*<sup>1,2</sup>, Jillian Wormington<sup>1</sup>, Bart Kensinger<sup>1</sup>, Kristen Bayley<sup>1</sup>,  
Scott Goepfner<sup>1</sup>, Kyle Gustafson<sup>1</sup>, and Barney Luttbeg<sup>1</sup>  
<sup>1</sup>Oklahoma State University, Stillwater, OK 74078  
<sup>2</sup>Penn State Erie, The Behrend College, Erie, PA 16563

9:20 – 9:40           **Growth and Body Condition of the Common Map Turtle (*Graptemys geographica*): A 19-Year Study of Inter-Annual and Seasonal Variation**  
Peter V. Lindeman, Edinboro University of Pennsylvania, Department of  
Biology and Health Sciences

9:40 – 10:00         **Examining Intervals of Dune Activation to Evaluate Late Holocene Landscape Evolution in the White River Badlands, South Dakota**  
Patrick Burkhart, Colton Byers, and Henry Kramer, Slippery Rock  
University, Department of Geography, Geology, and the Environment

10:00 – 10:20       **A 5,000 year record of late Holocene climate change in Newfoundland reconstructed using oxygen isotope analysis of lake sediment cores**  
Matthew S. Finkenbinder<sup>1</sup>, Ellen C. Weber<sup>1</sup>, Alexandria R. Aspey<sup>1</sup>,  
Broxton W. Bird<sup>2</sup>, Byron A. Steinman<sup>3</sup>, Samuel Z. Mark<sup>4</sup>, Sid P. Halsor<sup>1</sup>  
<sup>1</sup>Department of Environmental Engineering and Earth Sciences, Wilkes  
University, Wilkes-Barre, Pennsylvania  
<sup>2</sup>Department of Earth Sciences, Indiana University Purdue University  
Indianapolis, Indianapolis, Indiana  
<sup>3</sup>Large Lakes Observatory and Department of Earth and Environmental  
Sciences, University of Minnesota Duluth, Duluth, MN, USA  
<sup>4</sup>Department of Geology and Environmental Science, University of  
Pittsburgh, Pittsburgh, Pennsylvania

10:20 – 10:40       **BREAK**



- 10:40 – 11:00      **The Effect of Cinnamaldehyde Ointment on Prevention and Treatment of *Staphylococcus aureus* and *Pseudomonas aeruginosa***  
Robert Waters, M.S.\*, Daniel L. Austin, PharmD, Nancy Cary, Ph.D.,  
Christopher Keller, Ph.D., FNAOME  
Lake Erie College of Osteopathic Medicine, Laboratory of Human  
Pathogens, Erie, PA
- 11:00 – 11:20      **Auditory midbrain hypoplasia and dysmorphology after prenatal valproic acid exposure**  
Yusra Mansour\*, Sarah Mangold, Devon Chosky, Randy J. Kulesza, Jr.,  
Ph.D.  
Lake Erie College of Osteopathic Medicine, Department of Anatomy,  
Erie, PA
- 11:20 – 11:40      **Impact of Neonatal Excitotoxicity on the Auditory Brainstem**  
Weam Altaher, M.S.  
Lake Erie College of Osteopathic Medicine, Erie, PA
- 11:40 – 11:50      **Frozen Dragon’s Puff Treats**  
Maria Liggett, Erie County Department of Health  
*(Speed talk)*
- 11:50 – 12:10      **Comparison of Antibiotics and Essential Oil Preparations on Growth Inhibition of Methicillin Resistant *Staphylococcus aureus***  
Dominique Baker\*, Robert Waters, M.S., Kyle Scully, Ph.D.,  
Christopher Keller, Ph.D., FNAOME, Nancy Cary, Ph.D.  
Lake Erie College of Osteopathic Medicine, Laboratory of Human  
Pathogens, Erie, PA
- 12:10 – 12:20      **Evaluation of diaminopimelate decarboxylase blockers in non-pathogenic mycobacterial models**  
Gary Vanderlaan, Gannon University, Biology Department  
*(Speed talk)*
- 12:20 – 1:20      **LUNCH – THE SUNSET CAFÉ**
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- 1:20 – 2:00      **STUDENT AWARDS AND CLOSING REMARKS**  
Jeanette Schnars, Ph.D., Executive Director, RSC  
*Student Award Presentations*  
*Closing Remarks*

# ABSTRACTS

*Regional Science Consortium  
14<sup>th</sup> Annual Research Symposium  
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## **ORAL PRESENTATIONS**

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**Wednesday, November 7, 2018**

### **An Epic War: Presque Isle State Park vs. Invasive Plants**

Holly Best, M.A., Park Manager 3, Presque Isle State Park

Since the mid 1980's, the quantity of invasive plants found at Presque Isle State Park (PISP) has increased substantially. The park started battling the plants via mechanical means in the 1990's, but it wasn't enough. Fortunately, an ally was found in Ducks Unlimited, and PISP was able to partner with them to receive a large amount of Sustain Our Great Lakes (SOGL) funding. This funding helped PISP to obtain the necessary equipment and create programs that have assisted in winning some of the battles against the invasive species. Many other allies have joined in the battle and bring to the table their own special training and skills, including the Regional Science Consortium, Go Native Erie, California University of PA, Environment Erie, and Erie Bird Observatory. This presentation will be about invasive plants, partnerships, and how the park is trying to beat the odds.

### **The Presque Isle Priority Wetland Restoration (PIPWR) project: A Comprehensive Survey of Wetland Vegetation**

Robert S. Whyte, California University of Pennsylvania, Biological and Environmental Science Department

The Presque Isle Priority Wetland Restoration (PIPWR) project was initiated in 2012 and recently completed phase II of the project (2016-2018). PIPWR seeks to restore 400 acres of coastal wetland habitat at Presque Isle State Park, and improve native habitat structure and complexity, hydrologic connectivity, and water quality. PIPWR is a comprehensive multi-agency effort coordinated by Ducks Unlimited in cooperation with the PA-DCNR and the Regional Science Consortium. Presque Isle State Park in northwestern Pennsylvania is an arching sand spit extending into Lake Erie for approximately seven miles, includes. The 3,200 acre park contains several unique ecological communities including numerous emergent wetlands and an open-water lagoon system. Many of these native wetland plant communities have been outcompeted and overrun by invasive species including *Phragmites australis*, *Typha angustifolia*, and *Typha glauca*. The resulting monotypic stands of invasives do not provide the same functions as do areas rich in native flora. From 2012-2018 we monitored and measured the change in plant species composition, and habitat structure and quality by completing a comprehensive survey of the wetland vegetation in designated treatment areas (and control sites) before and after removal of *Phragmites* and other invasive and non-native species. *Phragmites* density has been greatly reduced and the return of more diverse emergent plant communities is now evident.

## **Four Seasons of Growing: Plant Propagation for Wetland Restoration on Presque Isle State Park**

Jen Salem, Go Native! Erie, Regional Science Consortium

Despite ongoing efforts to eliminate invasive plant species from Presque Isle State Park, targeted areas are not being repopulated by native plants quickly. The absence of these beneficial plants is an invitation for invasives to move back in, creating a situation where extensive treatment is necessary. The goal of this wetland restoration project is to grow and re-populate native wetland plants in three selected areas of Presque Isle. This will include propagation directly from plants found on the Park, and continual monitoring on the selected areas. The results of this project will be used by the PA DCNR and will impact future wetland restoration projects on Presque Isle State Park.

## **Fish and Amphibian Surveys in Restored Priority Wetland Habitats on Presque Isle State Park, Erie, PA**

Sean Dalton\*, Amber Stilwell, Jeanette Schnars, Regional Science Consortium

Encroaching invasive plant species can have numerous negative effects if left unopposed in priority wetlands for both fish and amphibian species, ultimately leading to the displacement of the animals. Using field observation methods, collection transects, as well as overnight recordings, surveys were conducted at 5 priority wetland habitat restoration areas distributed across Presque Isle State Park in Erie County, PA where treatment for invasive plants has been applied. Surveys were conducted both before and after native replanting efforts by Go Native! Erie. The surveys seek to catalog the change in native biodiversity in these restored habitats.

## **Effects of invasive plant control efforts on marsh breeding birds at a wetland complex along southern Lake Erie**

Sarah Sargent\*<sup>1</sup>, Christopher H. Lundberg<sup>2</sup>, and Anne Balogh<sup>3</sup>

<sup>1</sup>National Audubon Society, Meadville, PA; currently Erie Bird Observatory, Erie, PA 16505

<sup>2</sup>Allegheny College, Department of Biology, Meadville, PA 16335

<sup>3</sup>Licking County Parks Department, Granville, OH 43023

Invasive wetland plant species, especially *Phragmites australis*, have spread throughout the Great Lakes basin, forming dense monotypic stands, displacing more diverse native plant communities in emergent marshes. Presque Isle State Park (Erie, PA) is a 3200-acre sand spit with a complex of coastal ecological communities including approximately 1250 acres of wetlands. Using a standard point-based playback protocol, we completed an initial survey of marsh breeding birds at 28 points in 2011 (three visits per point), prior to an intensive effort to control invasive vegetation that began in 2012. In 2017 we conducted a second survey, revisiting the same points plus adding 7 new ones, with two visits per point. Pied-billed Grebe (*Podilymbus podiceps*), Common Gallinule (*Gallinula galeata*), American Coot (*Fulica Americana*), Virginia Rail (*Rallus limicola*), Sora (*Porzana carolina*), and Least Bittern (*Ixobrychus exilis*), were documented in 2011, with 42 total detections of target species, whereas only four species were detected in 2017, with 61 total detections. American Coot and Virginia Rail were absent in 2017. Least Bittern was the most abundant species in both years, with an estimated 12 unique individuals in 2011 and 31 in 2017. Least Bittern and Common Gallinule were more widespread in 2017 and were denser in several areas where vegetation control efforts had successfully reduced the dominance of invasive plants since 2011. Unusually high lake water levels in 2017 may have reduced habitat suitability for some marsh breeding birds.

## **Bacterial Communities of Human Remains and Adjacent Soils in Forensic Settings: Applications to Postmortem Interval Estimation**

Randi Depp, Mercyhurst University

Decomposing remains can be understood as an evolving ecosystem experiencing ecological succession as new biological species colonize the remains, modifying their physio-chemical characteristics as well as the resources and conditions made available to other species. Microbial organisms are the main actors in

this process, and the composition of the microbiota in and around the remains is expected to reflect this succession and thus correlate with the post-mortem interval (PMI). Although episodic observations and experimental studies utilizing animal proxies or laboratory models have approached this problem, there is a lack of studies employing an actualistic approach that utilizes data from actual forensic cases involving human remains. This proposal addresses this research gap by proposing the analysis of microbiota associated with human remains and the surrounding environment at actual forensic cases with different PMIs. These include both outdoor forensic anthropological field recoveries and forensic autopsies. Aside from providing a characterization of the microbiota at varying PMIs and under different environmental conditions, a key component of the research is development of sampling protocols and best practice guidelines for the collection of microbiological data and materials in forensic contexts, for future research endeavors.

### **Estimation of American Black and White Ancestry from Measurements of the Vertebrae and Sacrum**

Rhiann Dunn\*, Luis Cabo, Mercyhurst University, Department of Applied Forensic Sciences  
Ancestry estimation is one of the four biological profile analyses that are often requested of physical anthropologists. While the midfacial region has been shown to be the most accurate for ancestry estimation, skulls may not always be recovered in a forensic context. Therefore, it is necessary to have valid and reliable methods for the postcranial skeleton that are Daubert compliant. One such method was created by Ünlütürk (2017), which combines vertebral and sacral measurements in sex specific discriminant functions to differentiate between South African Black and White individuals using sectioning points. This study collected the measurements created in the original study from 4 vertebrae (C7, T1, T12, and L5) and the sacrum from 251 individuals at the Hamann-Todd Collection in order to test the validity of this method on American Black (n=126) and White individuals (n=125). Classification was lower than Ünlütürk (2017) reported (80-95%) when tested with the American sample (61-70%). When equations were retested with both sexes, classification performed at the same level of accuracy (63-71%) and Pearson's Chi-Square test was used to verify ancestry relationship ( $p < 0.001$ ). These results indicate that there is no need for sex specific equations when performing this method, as classification was based on morphological ancestral differences and not differences because of sexual dimorphism, often seen with size differences. As the results show that classification was based on ancestry, this study has shown the validity of this method, but lower classification accuracies indicate that it is more applicable to a South African population.

### **Age-at-Death Estimation from the Auricular Surface of the Human: A Comparison of Two Methods**

Andrea Ost, Mercyhurst University, Department of Applied Forensic Sciences  
Accurate age-at-death estimation is important for both paleodemographic studies and forensic casework. The most popular methods of estimating age use the cranial sutures, sternal rib ends, pubic symphysis, and auricular surface of the ilium. Although these traditional methods are well-validated, problems persist with identifying features on the auricular surface that estimate age accurately in older individuals.

This research tests the utility of two component auricular surface methods on a sample of 400 individuals, aged 16-93 years, from the Hamann-Todd Collection. The first method, developed by Igarashi et al. (2005) on a Japanese sample (N=700), scores the auricular surface for the presence/absence of 13 traits. Igarashi et al. includes separate equations for males and females, which is discordant with auricular surface methods popularly employed in the U.S. This research compares Igarashi et al. to Transition Analysis, developed by Boldsen et al. (2002). Transition Analysis uses Bayesian statistics to combine multiple skeletal age indicators, including the auricular surface, into an age estimate which can be performed with fragmentary remains.

Spearman's rank-order correlation tests were run for both methods and individual traits to assess correlation with age. Igarashi et al. showed a tendency to under-age. Transition Analysis had high accuracy rates in both young and old age classes, but disparate distributions in the intermediate age range. The auricular surface shows utility in aging older individuals, especially when used in conjunction with other skeletal age indicators. This research contributes to the greater understanding of age-related trait distributions throughout the life span.

### **USEPA Beaches Act: The Regulation and Pennsylvania's Responsibility Under the Act**

Chelsey Erickson, Erie County Department of Health

In October of 2000, the Beaches Environmental Assessment and Coastal Health Act or BEACH Act was signed into law. This law amended the Clean Water Act and required EPA to develop performance criteria for testing, monitoring, and notifying the public users of coastal recreation water quality problems. The EPA has provided grant monies since 2000 to assist coastal States, Territories, and Tribes in their ability to meet the performance criteria. In 2007, Erie County Department of Health was granted the responsibility of obtaining the grant from EPA and then administering the grant to meet the performance criteria. Since that time Erie County Department of Health has worked with various partners to ensure compliance with the BEACH ACT. This presentation will give an overview of the Act and what are the responsibilities under the Act.

### **Monitoring the increasing amount of Small Flow Treatment Facilities (SFTFs) in Erie County**

Matthew Elwell, Erie County Department of Health

There are currently 472 Small Flow Treatment Facilities permitted in Erie County with an increase of 15-20 facilities each year. SFTFs are sewage treatment systems that are installed when soils are not conducive to traditional septic systems and public sewer is not available. SFTFs discharge to streams after sewage treatment such as fixed film media or aeration and then disinfected using either chlorination or ultraviolet light. Initial inspections of SFTFs found that a majority of these systems were non-compliant for Operations and Maintenance (O&M) and/or Administrative failure to submit reports. Through a combination of educational reminders and required yearly inspections; there has been a significant increase of systems meeting compliance. Unchecked, SFTFs have a potential to have significant impacts on local waterways including streams being used for sport, drinking water sources, and the Great Lakes ecosystem. Effluent sampling of all SFTFs in the Lake Erie watershed has provided technical and analytical information on future impacts and current impacts of waterways.

### **Researching Stormwater Runoff at the White Township Recreation Complex in Indiana County, Pennsylvania**

Kayla Kroczyński\*, Katie Farnsworth, Indian University of Pennsylvania

Stormwater runoff is runoff generated from a storm event. Runoff occurs when rain from a storm falls on an impervious surface, cannot soak in, and runs across the surface - and eventually enters any nearby streams/rivers/watersheds. Impervious surfaces are any surfaces that water cannot soak into. This most commonly involves different paved surfaces (parking lots, sidewalks, driveways), but also includes tennis/basketball courts and building roofs.

The White Township Recreation Complex, located on East Pike Road in Indiana County, Pennsylvania, has two large parking lots, multiple paved driveways, tennis courts, basketball courts, and a 1.6-acre roof on the property. The complex is located right above a small neighborhood, through which a small stream called Marsh Run flows. Residents in the neighborhood have complained of increased flooding due to runoff from the complex.

The overall goal of the first part of the project is to model a .5 inch and then a 1 inch rainfall over the entire complex using ArcGIS and soil properties. This involves mapping flow accumulation and separating the complex into polygons based on where water flows and different soil classifications.

Infiltration rates are used to calculate a range between the minimum and maximum runoff possible from different areas within the complex. A data logger is being installed in Marsh Run to allow comparisons to be made between modeled and actual runoff data.

After data collection is finished and comparisons are made, green infrastructure will be researched in order to find a possible solution for the runoff problem in the complex. All findings will be presented to the White Township Board in February, in hopes of future implementation and mitigation of the problem.

### **Occurrence of Pharmaceutical and Personal Care Products in stream (raw) and drinking-water (finished) samples in the Susquehanna and Delaware Watersheds 2007-2009 compared to 2016 and in the Lake Erie Watershed in 2016**

Joseph Duris, United States Geological Survey

Results will be presented on study conducted in 2016 (1) to investigate whether or not concentrations of pharmaceuticals and personal care products (PPCPs) have changed in stream samples (raw) near drinking-water intakes at sites in the Susquehanna and Delaware Watersheds in the last 10 years and (2) to determine whether or not concentrations of PPCPs at those same sites in stream samples (raw) near drinking-water intakes and in treated (finished) waters in the Susquehanna, Delaware, and Lake Erie Watersheds are above reporting levels and how much is being removed from drinking water through the water treatment process.

### **NOAA's Focus on Harmful Algal Blooms**

Sarah Jamison, NOAA National Weather Service

Lake Erie harmful algal blooms (HABs) are addressed by the National Oceanic and Atmospheric Administration (NOAA) through their key roles of detecting and monitoring, predictive modeling and forecasting, and research. NOAA is a producer, consumer, partner, and integrator of river flow, temperature, and nutrient loading information needed to develop HAB forecasting tools. The severity of the western Lake Erie HAB is dependent on the input of Total Bioavailable Phosphorus (TBP), which is contributed primarily by the Maumee River during the loading season March 1-July 31. In early May, NOAA's National Ocean Services (NOS) branch estimates the expected bloom severity. This early season projection is designed to help guide water treatment facility managers and others to prepare for the anticipated HAB. In July, NOAA issues a seasonal HAB forecast of bloom severity that is similar to NOAA's seasonal hurricane forecasts. During the bloom season, NOS will issue twice weekly bulletins on the bloom extent and trajectory over the next few days. NOAA continues to work with state and local agencies, various universities, and other partners to enhance HAB forecasts as well as educate the public. NOAA researchers future goals are to study how HABs develop and what steps can be taken to lessen their impacts on Lake Erie communities.

## **ORAL PRESENTATIONS**

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**Thursday, November 8, 2018**

### **A Nowcast for *E.coli* and Cyanobacterial Harmful Algal Blooms**

Joseph Duris\*, Tammy Zimmerman, United States Geological Survey

Threats to our recreational and drinking waters include pathogenic organisms that cause disease and toxins produced by cyanobacterial harmful algal blooms (cyanoHABs) that can cause acute and chronic illnesses. *Escherichia coli* (*E. coli*) is one type of bacteria used to indicate pathogens may be present. Microcystin is the most frequently detected toxin in freshwaters produced by some species of



cyanobacteria (the bacteria that cause cyanoHABs). Traditional laboratory methods for *E. coli* or microcystin levels often take too long to be useful for prompt public health protection.

Water-resource managers need tools to quickly predict when and where these threats to our water resources occur. To address this, the U.S. Geological Survey (USGS) is collaborating with state and local partners on a Great Lakes Restoration Initiative (GLRI) effort to develop models to provide real-time estimates of *E. coli* and (or) microcystin levels at Great Lakes beaches and water intakes. Statistical models are the basis for real-time assessments in web-based systems called nowcasts, which have been used to estimate *E. coli* levels at recreational sites throughout the Great Lakes since 2006.

The goal of this study is to refine existing models and nowcasts and expand their use to new Great Lakes sites for estimates of *E. coli* and microcystin levels. Different types of models to estimate *E. coli* and microcystin (cyanoHAB) levels will be developed, depending on availability of data.

### **Comparison between cell counts of cyanobacteria and cyanotoxin concentrations using flow cytometry**

Amber Stilwell\*, Sean Dalton, Jeanette Schnars, Regional Science Consortium

The Regional Science Consortium collected and analyzed harmful algal blooms samples once per week at 26 sites around Presque Isle Bay, beaches, and the Lake Erie coastline of Pennsylvania from late May to late October of 2018. Cell counts of cyanobacteria were obtained by using a BD Accuri C6 Plus Flow Cytometer and through funding from Pennsylvania Sea Grant. This data will be compared to the cyanotoxin concentrations of Microcystins which were determined using the ELISA method from Abraxis through funding from CZM and GLRI grants. Results from several sampling locations will be presented the Regional Science Consortium Symposium during the Harmful Algal Bloom session.

### **Could microbes symbiotic with colonial cyanobacteria in Lake Erie's Presque Isle Bay affect the release of toxins during harmful algae blooms (HABs)?**

J. Michael Campbell\*, Angelea Belfiore, Mercyhurst University, Biology Department

Rick Diz, Gannon University, Department of Environmental Engineering

The underlying mechanisms which trigger the release of toxins from cyanobacteria during harmful algae blooms (HABs) are not clearly understood. The possibility that biotic interactions between toxin-producing cyanobacteria and other microbes that they associate with was investigated concurrent with an investigation of the plankton population dynamics in Lake Erie's Presque Isle Bay during the summers of 2016 and 2017. Colonies of the colonial cyanobacterium *Microcystis* found in samples collected from the bay during various stages of the summer HABs were examined at 1000X magnification using oil-immersion light microscopy. A diverse assemblage of eubacteria, protozoa, green algae and diatoms were documented as common symbionts within *Microcystis* colonies. High densities of the nanno-planktonic cyanobacterium *Pseudanabaena mucicola* were found to be frequently associated with *Microcystis* colonies undergoing apparent degradation, which suggests the possibility that this symbiont may have a role in affecting *Microcystis* toxin production. Experimental evaluation of symbiont-induced toxin production by *Microcystis* merits further investigation.

### **Predictive Modeling of Harmful Algal Blooms in Presque Isle Bay, Erie, PA, Using USEPA's Aquatic Ecosystem Model AQUATOX**

Rick Diz\*<sup>1</sup>, J. Michael Campbell<sup>2</sup>, Mostafa Tahmasebi<sup>1</sup>, Yashaswini Raviillu<sup>1</sup>, Angelea Belfiore<sup>2</sup>  
<sup>1</sup>Gannon University, Department of Environmental Science and Engineering, Erie, PA  
<sup>2</sup>Mercyhurst University, Department of Biology, Erie, PA

The frequency and intensity of harmful algal blooms in Presque Isle Bay have increased and the eutrophication status of the Bay has worsened over the past decade. The Bay lies along the southern shore of Lake Erie, constituting the harbor at Erie, PA. The USEPA's aquatic ecosystem model AQUATOX was employed to better understand factors leading to blooms of cyanobacteria, the so-called 'harmful algae'. Nutrient loadings from the watershed were estimated based on field monitoring of nutrient concentrations and volumetric discharge during storm events and baseflow. Actual wind, solar intensity, and water temperature were inputs to the model. Plankton and water samples were collected in the Bay every two weeks during the summers of 2016 and 2017 for model calibration. An *in situ* water quality buoy provided near continuous chlorophyll measurements during the summer seasons. Modelling revealed the response of cyanobacteria to increased water temperatures. Various management practices were evaluated to provide guidance to environmental managers for better allocation of scarce resources. It was found that the greatest benefit in terms of decreased toxin-producing cyanobacteria could be achieved by decreasing the sediment discharged into the Bay from the watershed. Use of the model by watershed managers would aid in choosing the best strategies for controlling the likelihood of cyanobacterial blooms.

### **Temperature and Precipitation Effects on Salamander Migration in Northwestern Pennsylvania**

Olivia Heeb, Allegheny College

Amphibians at high latitudes and elevations hibernate in a state of torpor through below-freezing winters as a survival mechanism, and reemerge in the spring to breed. Research on wild amphibians for their breeding habits, population studies, behaviour and even human medicine depends upon their emergence from hibernation. For this project I will further examine the variables that trigger migration of the northwestern Pennsylvania pond-breeding salamander *Ambystoma maculatum* from terrestrial hibernation such as air temperature, ground temperature at various depths, and precipitation. The goal of this study is to further research environmental reemergence and migration cues that have been examined throughout the past and explore other possible causes. I will use these results to better understand salamander populations and movement, to provide the preexisting pool of data with more measurements, and to give future experiments a better insight for when these species emerge in the spring.

### **Preliminary Limnological Characterization of the Presque Isle State Park Inner Lagoon System**

Robert S. Whyte\*, California University of Pennsylvania

Jeanette Girosky\*, Tom Ridge Environmental Center and Natural History Museum

The last large scale limnological study of the inner lagoon system of Presque Isle State Park was undertaken from 1960 – 1963 by Edward Kormondy (A Comparative Ecology of Sandspit Ponds, 1969). A general limnological survey was undertaken in the summer of 2018, in two of the larger ponds of the inner lagoon system, Big Pond and Long Pond, in preparation for a more specific quantitative study to be undertaken in 2019. We assessed water quality, noted existing plant communities and collected algal samples. The inner lagoon system is extensive and provides important fish and wildlife habitat, which occupy areas that may be impacted by ongoing and future park activities. We investigated and assessed both open water areas and the vegetative beds of *Nuphar advena* (Spatterdock), *Brasenia schreberi* (Watershield), and *Polygonum amphibium* (Water smartweed) for water quality. Data suggest the



extensive beds of vegetation strongly influence water quality. A small population of *Ranunculus aquatilis* var. *diffusus* (Pennsylvania rare plant) was observed in Big Pond. Algal samples were collected in open water with a 10 micron plankton net, hand grabs and scraping plants for epiphytic species. A sample of *Batrachospermum* sp. was obtained; this is the first record of a Rhodophyta collected on Presque Isle State Park to our knowledge. In 2019 we anticipate undertaking a more extensive limnological characterization of the system.

### **Range Expansion and Diet Composition of Round Gobies within the French Creek Watershed**

Casey Bradshaw-Wilson\*<sup>1</sup>, Josh Wisor<sup>2</sup>, Jay Stauffer, Jr.<sup>2</sup>

<sup>1</sup>Allegheny College, Meadville, PA

<sup>2</sup>Penn State University, University Park, PA

Round Gobies, *Neogobius melanostomus*, were discovered in the Pennsylvanian waters of Lake Erie in 1990 and have become among the most abundant benthic fish species in all five Great Lakes. In August of 2014, Round Gobies were discovered in a tributary of the upper Allegheny River Watershed, which is the first documented inland introduction in lotic systems of Pennsylvania. French Creek holds the greatest diversity of both fishes and freshwater mussels in much of the Eastern United States. Preliminary research in 2015, determined that Round Gobies have moved from their introductory location into the main channel of French Creek, but the impacts of that introduction on native fauna is unknown. The purpose of this study was to document range expansion and stomach content analysis of Round Gobies within the French Creek watershed. Results that Round Gobies have successfully invaded the main channel of French Creek and diet analysis shows they are eating a high percentage of native freshwater mussels, which was unexpected. Larger impacts are still under investigation but the presence of freshwater mussels in stomach contents are of significant conservation and management interest.

### **Prevalence of intersex in *Micropterus dolomieu* collected from Presque Isle Bay, Pa and Long Point Bay, Ontario**

Sean D. Rafferty, Vicki S. Blazer, Heather Walsh, Tom Cermak, Ryan Braham, Jay R. Stauffer, Jr.

In 2013, the U.S. Department of State delisted the Presque Isle Bay Area of Concern partially in response to research showing that liver tumor rates in Presque Isle Bay, Pennsylvania and the reference site Long Point Inner Bay, Ontario were similar. Since the delisting, the question of whether or not other indicators (e.g. intersex) could be used to evaluate the ecological integrity of the Presque Isle Bay fish community has been raised. Intersex is a term used to indicate the presence of both male and female characteristics in an individual fish, including the presence of female oocytes within a male gonad or spermatocytes within a female gonad. While the cause(s) of intersex are not fully understood, many factors including exogenous steroids, temperature, behavior, and pollutants have been shown to influence sex differentiation in fish. Intersex, particularly testicular oocytes, in *Micropterus dolomieu* is being used more frequently as an indication of exposure to endocrine active compounds, including organochlorine pesticides, PCBs, heavy metals, pharmaceuticals, and surfactants. From 2013 to 2015, we assessed the prevalence of intersex in *M. dolomieu* collected from Presque Isle Bay and Long Point Bay. This presentation will highlight the results of these assessments.

### **Acute Decompression Sickness in Yellow Perch**

Jeanette Schnars, Ph.D., Regional Science Consortium; Charles Murray, PA Fish and Boat Commission; Jay Stauffer, Ph.D., The Penn State University

Yellow Perch inhabit deep (>20 m) waters, making them vulnerable to acute decompression sicknesses or barotrauma. The mortality of a Yellow Perch released by an angler is assumed to be very high, however had not been quantified. Release rates reach 97,000 Yellow Perch annually in the Pennsylvania waters of Lake Erie. Catch-release mortality is a management concern to Pennsylvania Fish and Boat Commission (PFBC) since fishery models currently assume no mortality of released fish. This study quantified different means of mortalities and investigated the outcome of two different release techniques: rapid descent cages, and an 18 meter vertical hoop net. Results revealed Yellow Perch have the ability to survive acute barotrauma if they are released at the surface or if quickly returned to depth; however survivability decreased later in the season when bottom water temperatures increased and dissolved oxygen decreased. Although Yellow Perch exhibiting barotrauma are capable of being released at the water's surface and are able to return to depth unaided, seagulls quickly consume any released fish. Additional studies will continue during the 2017 season to further investigate this research.

### **Effects of white-tailed deer on forest understory at Reinstein Woods, College Lodge and Jamestown Audubon nature preserves**

Ashley Gadzo, Jonathon Titus, Ph.D., SUNY-Fredonia

Deer have dramatically changed the vegetation of western New York forests. Plant species, including woody species, forbs and graminoids are all consumed by deer. Saplings of edible trees and shrubs are missing from the landscape as are many forb and graminoid species. These species "hang on" in areas deer cannot access. In addition, plant species that deer do not eat, principally non-native invasive species, have reduced competition from native species and are able to spread rapidly. This results in a non-native dominated understory with greatly reduced resources available to wildlife. Deer consume tree seedlings and saplings thereby changing the tree composition of the forests as well.

Another possibility is that non-native earthworm invasions may be facilitating non-native plant invasions and the decline of native forbs by altering the forest floors and soil characteristics: such as leaf litter abundance and incorporation, soil chemistry, pH, mycorrhizae presence, and soil disturbance. Non-native earthworms tend to have a positive abundance when deer graze upon plants. Earthworms impacts the native species by decreasing the survival ship and growth of sapling.

Deer exclosures have been linked to help restore our local forest by keeping out deer to allow plant growth inside. Deer exclosures are a minimum height of 2.5 meters and are made of wood and metal. In this study the deer exclosure were 50m<sup>2</sup>. We hypothesis that the vegetation will be significantly different inside and outside of deer exclosures as well as there will be abundance of earthworms outside of the exclosures then inside.

### **A Census of the Bat Population of Gannon University, Erie, PA**

Toni Leitshu\*, Alex Stauff\*, and Dr. Steve Ropski, Gannon University, Biology Department, Erie, PA

For the past nine summers, a census of the bat population has occurred on the Gannon University campus in Erie, PA. The numbers for the first three years held relatively steady, but the data for the past 6 years indicates a dramatic decline. White Nose Syndrome was first reported in 2006 in a cave in New York. The disease has killed an estimated 6 million bats in the eastern United States since then and has spread throughout Pennsylvania and into northeastern Ohio. This fungal infection has killed 95% of bats in some caves and may result in the listing of three bat species as endangered in Pennsylvania, including the Little Brown Bat (*Myotis lucifugus*), the predominant bat on the Gannon campus. This study will compare yearly data by building, time of year, building side and species composition to determine how White Nose Syndrome has affected the Gannon campus bats. A decrease in numbers may be partially responsible for an increase in West Nile Virus in the area. The results will also be used to place bat houses at appropriate locations to encourage bat presence on campus.

### **Differentiating between native American bittersweet (*Celastrus scandens* L.) and invasive Oriental bittersweet (*C. orbiculatus* Thunb.) using morphological and germination parameters**

Connor Mauche, SUNY-Fredonia

Oriental bittersweet (*C. orbiculatus* Thunb.) is an invasive congener that poses a threat to both the native species (*Celastrus scandens* L.) and local ecosystems. As compared to the native, Oriental bittersweet is more tolerant of shade, obtains a greater height, and it is not readily distinguishable. Previous research has proposed leaf, fruit, and seed characteristics as possible identifiers. Samples and measurements will be taken of both native and invasive specimens across Western NY. This study aims to compare leaf length:width ratio of terminal and base vine leaves, fruit volume, seed count, shade conditions, and height variation. Furthermore, a greenhouse experiment will be implemented in spring 2019 in order to measure germination percentage, and growth rate. Under natural settings, it is hypothesized that Oriental bittersweet will be more likely to have a greater height, grow in more shaded conditions, and will have a leaf length:width ratio closer to 1:1, as compared to the native. American bittersweet is hypothesized to have larger fruit volume, and less seeds than the invasive. Under greenhouse conditions, Oriental bittersweet is hypothesized to have a greater germination percentage, and a faster growth rate. Preliminary results will be shared at the conference.

### **Shallow Wilderness: Working to Expand Interest in Suburban Ecology**

Rowan Baxter-Green, Allegheny College

(*Speed Talk*)

This project will attempt to answer the question of how I can describe how I can describe suburban ecosystems so that people understand that they have ecological importance. The driving factors behind this are rooted in the need for environmental awareness in the face of global climate change. Because a large proportion of people live in urban and suburban areas, and because of the false assumption that only uninhabited lands are truly wild, there is a disconnect between many people and the environment. One solution to this disconnect is to make people realize that there is nature all around them, and to get them to appreciate that nature. This project will take the form of a literature review, followed by a series of creative nonfiction essays. The ideal outcome is that those essays will inspire people to appreciate and act in favor of suburban ecosystems.

## ORAL PRESENTATIONS

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Friday, November 9, 2018

### **The morphology of fear: transgenerational effects of predation risk in freshwater snails**

Lynne Beaty\*<sup>1,2</sup>, Jillian Wormington<sup>1</sup>, Bart Kensinger<sup>1</sup>, Kristen Bayley<sup>1</sup>, Scott Goeppner<sup>1</sup>, Kyle Gustafson<sup>1</sup>, and Barney Luttbeg<sup>1</sup>

<sup>1</sup>Oklahoma State University, Stillwater, OK 74078

<sup>2</sup>Penn State Erie, The Behrend College, Erie, PA 16563

An organism's phenotype is shaped by environmental information acquired both within- and across generations. Our aim was to determine how different aspects of phenotype respond to cues of predation risk experienced in current and previous generations. To do this, we examined the plasticity of behavioral and morphological anti-predator traits within- and across generations in *Physa acuta*, a freshwater snail. Using a full factorial design consisting of exposure to predator or control cues in parent and/or offspring generation, we reared 18 maternal lines of snails and quantified the anti-predator behavior, shell shape, shell size, and crush resistance in the offspring generation. We found that most morphological traits exhibited transgenerational plasticity, with parental exposure to predator cues resulting in larger and more crush-resistant offspring. Shell shape, on the other hand, demonstrated within-generation plasticity such that predator-exposed snails had longer spires and narrower apertures. Anti-predator behavior also expressed only within-generation plasticity with offspring that were reared in predator cues responding less to the threat of predation than control offspring, regardless of parental treatment. Overall, our study highlights the potential for transgenerational plasticity in select traits and stimulates additional inquiry in to the consequences of transgenerational plasticity in nature. Furthermore, our study demonstrates the need to further investigate the extent to which different species and traits respond to transgenerational environmental cues.

### **Growth and Body Condition of the Common Map Turtle (*Graptemys geographica*): A 19-Year Study of Inter-Annual and Seasonal Variation**

Peter V. Lindeman, Edinboro University of Pennsylvania, Department of Biology and Health Sciences

I studied growth in common map turtles (*Graptemys geographica*) at Presque Isle from 1999–2017. I captured 1724 individuals with 1–9 recaptures for 529 turtles (888 total). Plastral annuli were a reliable indicator of age for up to 10 years in females and up to 6 years in males in 236 of 248 recapture events (95%) that spanned an average of 2.2 years (range 1–6). Recaptured turtles of known age were up to 19 years old in both sexes and adults  $\leq 19$  years of age spanned the entire range of adult body sizes for each sex, although growth continued for many adults of all sizes. I measured medial widths of completed growth annuli for 1937 annulus widths from 381 females and 910 annulus widths from 224 males. Regression modelling related annulus width of each sex to age (declining width with age, as per the von Bertalanffy growth model) and to year. Years that had poorer or better growth were highly congruent between the sexes and the amount of growth was positively correlated with growing degree days during the period when turtles exhibited new growth, 11 June–19 August. Climatic data indicate warming of Presque Isle and data from 18 *G. geographica* specimens collected at Presque Isle in 1900 suggest that contemporary growth is enhanced by the warming environment. Variation in body condition was weak interannually, but body condition was highest in September, when turtles were not growing and were nearing the onset of the lengthy winter brumation in Erie.

## **Examining Intervals of Dune Activation to Evaluate Late Holocene Landscape Evolution in the White River Badlands, South Dakota**

Patrick Burkhardt, Colton Byers, and Henry Kramer, Department of Geography, Geology, and the Environment, Slippery Rock University

We have been studying Late Holocene landscape evolution in the White River Badlands of South Dakota. Our earlier work demonstrated that slopes throughout the region had been dissected into sod tables within the last millennium. Timing of this incision is constrained by paleosols, for which we possess almost three dozen radiocarbon ages, that formed upon stable slopes. The incised gullies cut across these paleosols, therefore, the incision event is younger than approximately one thousand years ago. Such timing implies that one of either of two climatic events could have triggered the change in landscape. The Medieval Climate Anomaly existed between 900 and 1,300 AD, while the Little Ice Age spanned from 1,300 to 1,880 AD. To evaluate if either of these events disrupted the landscape, we have turned to dunes for additional evidence of climate change. In the Badlands, sand sheets and parabolic hairpin dunes, with a maximum relief of 30 m, dominate the dune fields. To visualize the dune morphology, we have collected exquisite drone photography. The dunes open to the northwest, consistent with the modern dominant wind direction for the region. We have also utilized Optically Stimulated Luminescence to date the most recent mobilization of sand, through which we note that recent aeolian sedimentation began by 600 years ago and lasted to historic times, coincident with the Little Ice Age (LIA). We are expanding our investigation of the dune sands, looking for geochemical fingerprints to resolve the provenance of the sand.

## **A 5,000 year record of late Holocene climate change in Newfoundland reconstructed using oxygen isotope analysis of lake sediment cores**

Matthew S. Finkenbinder<sup>1</sup>, Ellen C. Weber<sup>1</sup>, Alexandria R. Aspey<sup>1</sup>, Broxton W. Bird<sup>2</sup>, Byron A. Steinman<sup>3</sup>, Samuel Z. Mark<sup>4</sup>, Sid P. Halsor<sup>1</sup>

<sup>1</sup>Department of Environmental Engineering and Earth Sciences, Wilkes University, Wilkes-Barre, Pennsylvania

<sup>2</sup>Department of Earth Sciences, Indiana University Purdue University Indianapolis, Indianapolis, Indiana

<sup>3</sup>Large Lakes Observatory and Department of Earth and Environmental Sciences, University of Minnesota Duluth, Duluth, MN, USA

<sup>4</sup>Department of Geology and Environmental Science, University of Pittsburgh, Pittsburgh, Pennsylvania

Terrestrial climate reconstructions in northeastern North America have been developed from a variety of archives using myriad proxies, many of which exhibit fluctuations in inferred temperature and precipitation. However, relatively few high-resolution (decadally resolved) paleoclimate records have been developed from Atlantic Canada and specifically Newfoundland that span the Medieval Climate Anomaly (MCA) and Little Ice Age (LIA). As a result, the exact nature of decadal scale climate variations across these well-known climate events is still actively debated. Here, we present a decadal to centennial resolution carbonate oxygen isotope ( $\delta^{18}\text{O}$ ) record spanning the last ~ 5,000 calendar years before present (cal yr BP) from a small, hydrologically open-basin marl lake located in west-central Newfoundland. Stable isotope data from regional lakes, rivers, and precipitation samples indicate the carbonate  $\delta^{18}\text{O}$  record primarily reflects changes in the  $\delta^{18}\text{O}$  of meteoric precipitation and atmospheric temperature. A general trend of decreasing  $\delta^{18}\text{O}$  values from ~ 5,000 cal yr BP to the present is broadly consistent with cooling associated with declining Boreal summer insolation. Variable  $\delta^{18}\text{O}$  values across the last millennium indicate decadal to centennial scale climate variations during the MCA and LIA. Comparison of the  $\delta^{18}\text{O}$  record against records of external forcing, Greenland ice core  $\delta^{18}\text{O}$  data, and regional terrestrial and marine paleoclimate records supports the idea of substantial spatiotemporal climate variability in the broader North Atlantic region during the late Holocene.

## **The Effect of Cinnamaldehyde Ointment on Prevention and Treatment of *Staphylococcus aureus* and *Pseudomonas aeruginosa***

Robert Waters, M.S.\*, Daniel L. Austin, PharmD, Nancy Cary, Ph.D., Christopher Keller, Ph.D., FNAOME

Lake Erie College of Osteopathic Medicine, Laboratory of Human Pathogens, Erie, PA

**Introduction:** *Staphylococcus aureus* and *Pseudomonas aeruginosa* are becoming resistant to increasing numbers of antibiotics, leading to a need for new treatment options. The goal for this study was to determine if compounding Cinnamaldehyde (CA) into an ointment would have an inhibitory effect against both bacteria.

**Methods:** Prevention and treatment experiments were conducted for the 2% CA ointments and 100% CA against both bacteria. The plates were incubated at 37°C overnight. The zone of inhibition was then measured and compared.

**Results:** For the prevention studies, there was no significant difference between the 100% CA or the CA ointments, however the 100% CA did trend slightly larger for all strains of *S. aureus* and *P. aeruginosa*. For the treatment studies, there was no effect on growth inhibition for all strains of *S. aureus* treated with 100% CA or the ointments. However, all strains of *P. aeruginosa* were inhibited by treatment with 100% CA and the ointments with larger ZOIs than observed in the prevention experiments.

**Conclusion:** Results presented here demonstrate that a 2% CA ointment is as effective as 100% CA. Thus the 2% CA ointment preparation might be used as a preventative technique for skin infections in burn victims or for diabetic foot wounds. In addition, the ointment might also be used as a novel treatment for topical *P. aeruginosa* infections. Further studies examining the effect of CA ointment in toxicity studies and animal models are in preparation.

## **Auditory midbrain hypoplasia and dysmorphology after prenatal valproic acid exposure**

Yusra Mansour\*, Sarah Mangold, Devon Chosky, Randy J. Kulesza, Jr., Ph.D.

Lake Erie College of Osteopathic Medicine, Department of Anatomy, Erie, PA

Prenatal exposure to the antiepileptic valproic acid (VPA) is associated with an increased risk of autism spectrum disorder (ASD) in humans and is used as an animal model of ASD. The majority of individuals with ASD have hypersensitivity to sensory stimuli and some manner of auditory dysfunction. Previous studies of animals exposed to VPA have revealed abnormal neuronal responses to sound and mapping of sound frequency in the cerebral cortex and hyperactivity, hypoplasia and abnormal neuronal morphology in cochlear nuclei (CN) and superior olivary complex (SOC). Herein, we examine the neuronal populations in the lateral lemniscus and inferior colliculus in animals exposed in utero to VPA. We used a combination of morphometric techniques, histochemistry and immunofluorescence to examine the nuclei of the lateral lemniscus and the central nucleus of the inferior colliculus. We found that the VPA exposure results in larger neurons in the CNIC and the dorsal nucleus of the lateral lemniscus (DNLL). However, we found that there were significantly fewer neurons throughout the auditory brainstem in VPA-exposed animals. Additionally, we found that there was a significant drop in the proportion of neurons that were calbindin-immunopositive in the DNLL. VPA exposure had no impact on the proportions of perineuronal nets in the NLL or CNIC. Finally, consistent with our observations in the CN and SOC, VPA exposure resulted in fewer TH-immunopositive puncta in the CNIC. These results, together with our previous findings, indicate that *in utero* VPA exposure significantly impacts the auditory brainstem and that these alterations extend throughout the brainstem centers.



## **Impact of Neonatal Excitotoxicity on the Auditory Brainstem**

Weam Altaher, M.S.

Lake Erie College of Osteopathic Medicine, Erie, PA

Glutamate is the most abundant excitatory neurotransmitter in the central nervous system and is stored and released by neurons and astrocytes. Neurons in the neonatal central and peripheral nervous systems are sensitive to glutamatergic excitotoxic effects. Excitotoxic events during the early neonatal period have resulted in near complete loss of retinal ganglion cells and concomitant loss of axons in the optic nerve (Foran et al, 2017). Results from our investigation of excitotoxicity revealed a significant loss of neurons and abnormal expression of calbindin in brainstem auditory neurons. These results suggest that the impact of neonatal excitotoxicity on the auditory system originates from injury to neurons in the spiral ganglion. We examined the impact of neonatal exposure to monosodium glutamate on spiral and vestibular ganglia, the number of inhibitory terminals surrounding the superior olivary complex nuclei and the number of excitatory and inhibitory terminals surrounding globular bushy and medial nucleus of the trapezoid body cells.

We exposed male rat pups to 4mg/g of monosodium glutamate from P4 - P10. On P28 the rats were sacrificed, and their brains were extracted for analysis. There was a significant decrease in density of neurons in spiral ganglia and an increase in cross-sectional area of MSG-exposed animals. A significant decrease in the number of excitatory terminals surrounding the globular bushy cells and cells of the medial nucleus of the trapezoid body was observed. A significant decrease in the number of inhibitory terminals surrounding globular bushy cells, medial nucleus of the trapezoid body and lateral superior olive nuclei was also observed. These results suggest that an early excitotoxic environment significantly impacts neurons in the central auditory system.

## **Frozen Dragon's Puff Treats**

Maria Liggett, Erie County Department of Health

*(Speed talk)*

A business recently submitted an application for a food license to the Erie County Department of Health (ECDH) to apply liquid nitrogen to cereal puffs at the point of sale and immediately serve to consumers. The Department was extremely concerned about the safety risk and potential for injury to both consumers and employees due to the extreme cold temperature of the product. The Department consulted its medical director, a Board of Health physician, other County and state agencies, OSHA, local code officials and researched FDA's position. ECDH developed a policy that established strict Conditions of Licensing that were implemented in Erie County. The findings and final policy were shared with other health departments in Pennsylvania and New York. Local code enforcement officials did not allow the operation due to the hazards of liquid nitrogen and FDA issued a statement advising the public not to consume this product.

## **Comparison of Antibiotics and Essential Oil Preparations on Growth Inhibition of Methicillin Resistant *Staphylococcus aureus***

Dominique Baker\*, Robert Waters, M.S., Kyle Scully, Ph.D., Christopher Keller, Ph.D., FNAOME, Nancy Carty, Ph.D.

Lake Erie College of Osteopathic Medicine, Laboratory of Human Pathogens, Erie, PA

**Introduction:** Methicillin-Resistant *Staphylococcus aureus* (MRSA) is a gram positive bacteria that is the most common cause of cellulitis and folliculitis. Given the prevalence of MRSA in the community and its ability to acquire resistance, it is important to investigate potential novel therapies. Our previous studies have shown that select essential oils have greater inhibitory effects on the growth of MRSA than some antibiotic disks. Thieves oil, an anecdotal remedy for recurrent MRSA infections, is a blend of cinnamon cassia bark, eucalyptus, rosemary, clove, and lemon oil. In this study, we examined the effect of Thieves oil on inhibiting the growth of MRSA in comparison to pure essential oils and selected antibiotics.

**Methods:** The Kirby-Bauer disk diffusion method was used to produce zones of inhibition (ZOIs) to compare the effect of 5 pure essential oils, 7 antibiotics, and the Thieves oil blend on the growth inhibition of MRSA lab strain BAA977.

**Results:** The ZOI produced by Thieves oil was smaller than the ZOI of all the antibiotics except for penicillin. When comparing the pure essential oil ZOIs to that of Thieves oil, it was found that cinnamon cassia bark and rosemary oil had greater ZOIs while clove, eucalyptus, and lemon oil had smaller ZOIs compared to Thieves oil ZOI.

**Conclusion:** Results presented here suggest that Thieves oil is not an appropriate antimicrobial for MRSA infections. Future studies should be performed to compare the MIC and the MBC of the most effective oils, cinnamon cassia bark and rosemary oil.

### **Evaluation of diaminopimelate decarboxylase blockers in non-pathogenic mycobacterial models**

Gary Vanderlaan, Gannon University, Biology Department

*(Speed talk)*

*Mycobacterium tuberculosis* accounts for 3 million deaths globally each year. The advent of multidrug-resistant (MDR-TB) and extensively drug-resistant (XDR-TB) *M. tuberculosis* strains versus rifampin, isoniazid, ethambutol, and/or pyrazinamide treatment leaves few options for either prophylaxis, primary infection, or latency. From an economic standpoint, the CDC estimates that MDR-TB and XDR-TB are roughly 9-fold and 30-fold more costly to treat than non-multidrug resistant tuberculosis cases. In both plants (*Triticum vulgare*) and bacteria (*Mycobacterium spp.* and *Bacillus spp.*), lysine amino acid is non-essential due to anabolic pathways for lysine synthesis. The prokaryotic *lysA* gene product, diaminopimelate decarboxylase (DAPDC), is the final enzyme in this anabolic pathway wherein it specifically catalyzes D,L-diaminopimelate (D,L-DAP) substrate into lysine product. Since lysine amino acid is essential in the human diet, DAPDC is thus an attractive enzyme as a tuberculocidal target. Previous work has established competitive inhibition of DAPDC enzyme activity via application of either lanthionine sulfoxide in *Bacillus sphaericus* or L,L-DAP (substrate stereoisomer of DAPDC) in *M. tuberculosis*. Here we seek to evaluate the extent of these two competitive inhibitors in perturbing the growth of three sister species, *M. smegmatis*, *M. fortuitum*, and *M. marinum*. Each is a nonpathogenic mycobacterial species, except in immunocompromised individuals. *M. marinum* in particular has been shown to drive caseous- and non-caseous granulomas in a zebrafish model of *Mycobacterium* infection. Future work might investigate the possible rescue of *M. marinum*-infected zebrafish with either lanthionine sulfoxide and/or L,L-DAP host delivery.



# ABSTRACTS

*Regional Science Consortium  
14<sup>th</sup> Annual Research Symposium  
November 7–9, 2018  
Tom Ridge Environmental Center  
at Presque Isle State Park*

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## **POSTER PRESENTATIONS**

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**POSTER SESSION: Wednesday, November 7<sup>th</sup>, 2018, 6pm—8pm**

### **1. Reducing Cigarette Litter at Presque Isle State Park Beach 10**

Samuel LaFuria\*, Sarah Bennett, Mercyhurst University, Biology Department

About 4.5 trillion cigarette butts are littered every year, contaminating the environment with dozens of dangerous chemicals and non-biodegradable substances. With a rate of 75% of cigarette butts being discarded improperly, the ecological impacts are substantial yet reducible (Wallbank et al., 2016). The purpose of this project is to reduce the number of cigarette butts polluting Presque Isle beach 10 through the implementation of six designated cigarette waste canisters placed in heavy-traffic areas of the beach. We hypothesize that the presence of cigarette waste canisters will reduce the number of cigarette butts collected during Adopt-A-Beach cleanups. In order to track their usage, the number of cigarette butts in each canister were counted 1-2 times per week for two summers since their installation in August 2017. Volunteers have counted the number of cigarette butts collected on the beach during each Adopt-A-Beach cleanup from May-August every year since 2013. The average number of cigarettes collected on the beach is lower in the year after the canisters were installed than in the years prior. This suggests a decrease in cigarettes being littered on the beach due to the presence of the canisters. However, additional data are needed to determine if decreases are statistically significant.

### **2. Promoting Environmental Stewardship through Citizen Science**

Holly Travis, Ph.D.\* , Erin Janetski, Indiana University of Pennsylvania, Biology Department

**Citizen science** is a partnership between the general public and the scientific community to conduct authentic scientific research. Citizen science projects can potentially generate enormous datasets, contributing to ecology and conservation research worldwide while also increasing environmental stewardship and generating environmentally responsible citizens. We created the **Western Pennsylvania Watershed Collaboration** (WPAWC), a curriculum-based citizen science stream monitoring program that meets multiple state education standards and brings together local school students, conservation groups, educators, and university faculty to assess water quality and improve environmental attitude and engagement.

### **3. Teaching acid-base homeostasis using collaborative problem-based learning method and human patient simulators in a physiology laboratory**

Mary Vagula\* and He Liu, Gannon University

Students find it hard to understand acid-base homeostasis and the mechanisms involved in compensating for acid-base imbalances, including the role of the lungs and kidneys in this process. We have developed a laboratory activity based on collaborative problem-based learning and human patient simulators (HPSs)

to teach this topic. Students (n=50) were divided into small groups and presented with five cases of acid-base imbalances simulated in HPSs. After recording various parameters including arterial blood gases, they collaborated in identifying the specific acid-base imbalance. An anonymous survey following the laboratory activity revealed that this laboratory improved their understanding of acid-base regulation (92%), improved quantitative understanding of acid-base physiology (90%), and improved understanding of acid-base imbalances (94%).

#### **4. Biochar-Alumina composite materials for enhanced stormwater treatment**

Justin Drehs\*, Matt Colbert\*, Jason Geiger\*, and Varun Kasaraneni, Gannon University  
Harmful Algal Blooms (HABs), colonies of algae and/or cyanobacteria, occur when their populations drastically increase. Often, this is due to excess nutrient leaching (primarily nitrogen and phosphorus) into surface waters of ponds, lakes and oceans. HABs produce toxins that contaminate water, affecting people and wildlife. Once HABs subside, dissolved oxygen levels may decrease to harmful levels for wildlife.

While some attempts have been made to control agricultural and urban pollutants, achieving optimal goals has proven extremely difficult. Current best management practices (BMPs) for stormwater management may be extremely costly, and may only target a specific pollutant, such as suspended solids. Biochar offers unique advantages to filtration due to its low cost and versatility. Biochar is made by heating a biological material in the absence of oxygen, a process known as pyrolysis. Biochar feasibly filters by-product waste from farmlands and industrial runoff.

For this study, corn cobs will be used as the feedstock for the biochar. It has been demonstrated that unaltered biochar has positive effects on contaminant removal. By altering biochar with aluminum oxide nanoparticles, it is possible that these positive effects could be enhanced. The goal of this study to attempt to use unaltered biochar and biochar altered with nanoparticles to reduce the amount of heavy metal ions, phosphates, nitrates, and microbes in water with a known level of contamination.

#### **5. Calcium Leaching in Soil Under Acidic Conditions**

David Kyle Breault\*<sup>1</sup>, Gabe Armatas<sup>2</sup>, Dale Tshudy<sup>3</sup>

<sup>1</sup>Student of Department of Biology, Edinboro University of Pennsylvania

<sup>2</sup>Department of Chemistry, Edinboro University of Pennsylvania

<sup>3</sup>Department of Geology, Edinboro University of Pennsylvania

Calcium, which is found naturally in soil, is an essential element for plant health. This research reviews the impact of nitric acid on calcium leaching in granular soil. Specifically, if acid rain causes calcium to leach more than less acidic rain. This experiment was done by analyzing known concentrations of nitric acid, which was mixed into soil samples. An atomic flame photometer was used to measure calcium levels which came out of a soil filtrate. This paper seeks to answer the question if acid rain causes essential plant nutrients to leach farther down into the soil.

#### **6. Cookies on the Mountain: Investigation the Growth Habits of *Pinus albicaulis* using Tree Ring Data**

Mark Mullinger, Mercyhurst University

Whitebark pine (*Pinus albicaulis* Engelm.), an endangered, subalpine conifer native to western North America, is currently experiencing steep population decline due to White Pine Blister Rust (WPBR) and Mountain Pine Beetle (MPB). *P. albicaulis* seeds are also an important food source for many birds and mammals. One such bird, Clark's nutcracker (*Nucifraga columbiana*), is the major dispersal agent for the species via seed caching. This behavior is believed to be directly responsible for the multi-stemmed growth form typical of whitebark pine. Previous study with molecular methods concluded that individual stems within a cluster are genetically distinct, but it is unclear to what degree this is true. This study capitalizes on a rare opportunity to evaluate that claim using dendrochronological techniques, analyzing the relationship between pith dates of stems both within clusters and between neighboring clusters. Data

were collected in the form of whole tree cookies taken from a population near South Lake Tahoe, CA. Because of the protected nature of this species, relatively few tree-ring studies of comparable size have been sampled. Cookies were taken and dated at both the root collar and breast height. Data suggests that a few stems within each cluster may belong to the same individual rather than all stems being unique, which is valuable information for the genetic diversity and conservation of the species. Further work on this important data set will look at recruitment and assessment of the impact that climate and human activity have on the growth of the species.

## **7. Investigation of Correlation between Multiple Factors and Urinary Dopamine Level**

Shamim Chaparian\*, Isaac Hodapp\*, Ashley Crilley, and He Lui,

Gannon University, Department of Biology, Morosky College of Health Professions and Sciences

Dopamine is a neurotransmitter, the chemical signal molecule between nerve cells. Dopamine is produced in many different areas of the brain as well as in the kidney. In this study, 63 urine samples (23 in early February and 40 in early September) from Gannon University students and members of the Erie community were collected. We were interested in finding out how the levels of dopamine in the body differ under certain conditions, for example, season, gender, diet, exercise level, and seasons. We measured dopamine concentration with an ELISA kit. The sample concentrations were calibrated by creatinine, a metabolic product produced at a relatively constant rate in the body. Our preliminary results show that the average dopamine level in the samples collected in the winter is more than twofold the average dopamine level in the samples collected in the summer, with or without creatinine calibration. A subset of the subjects who gave samples in both seasons also showed similar differences. Repeated measurements and further data analysis will be conducted to examine correlations between the variation of dopamine levels and other factors.

## **8. Aeroponics and Leafy Greens**

Kherrin Morgan\*, Leslie Postek\*, Stephanie Majewski\*, Gannon University, Department of Environmental Science and Engineering

The purpose of this project is to analyze the growth of three varieties of leafy green vegetables in a custom made aeroponic system. Plant varieties are likely to include bok choy, kale, and a variation of lettuce. The aeroponic system will function without soil, promoting plant growth solely by means of water, nutrients, and an artificial light source. The aeroponic system will be compared to a small hydroponic system for a comparative analysis of water usage. Water availability, light exposure, and nutrient levels will remain constant for all growing sites in the experiment (hydroponic and aeroponic), with the possibility of a uniform change to any component if compromised growth is observed through the growth period. Optimal levels of water, light, and nutrients will ideally be found through the growth period and a record of all changes will be kept. Nutrients will be delivered to growing sites as a solution in water pumped and circulated throughout the system. The outcome goal will be to produce three varieties of mature, edible, market-grade, leafy vegetables. Market-grade quality will be determined by edibility, size, taste, and aesthetic appearance. Collected data sets will include nutrient, water, and energy usage and pricing, price per unit of vegetable, and percent yield. Findings will serve as a preliminary cost analysis for creating a future large-scale system. They will be reported to an outside organization aiming to generate organic produce for a known food desert in downtown Erie, Pennsylvania.

## **9. Functional Wetland Assessment of Migrated Wetlands in Southwest, PA: Benthic Macroinvertebrate Development and Community Composition**

Matt Carter\*, Robert S. Whyte, California University of Pennsylvania, Department of Biological and Environmental Sciences

To compensate for impacts to project area wetlands resulting from Interstate 70 highway construction activities, constructed wetlands were built on Pennsylvania Game Commission property at State Game Lands 297 and 302 in southwest PA. Wetland mitigation efforts include the design, construction and

subsequent monitoring. Monitoring of mitigated wetlands is essential to ensuring that projects are managed appropriately following construction and adjusted or modified as necessary to comply with objectives as described in the mitigation plans. The intent of these monitoring efforts is to ensure that appropriate wetland development and function is occurring, and outcomes will achieve the intended mitigation goals. Results presented represent post-construction years 2 and 3 of a 5 year monitoring program for benthic macroinvertebrates. Benthic macroinvertebrates were sampled using Hester-Dendy plate samplers and D-frame dip nets. Preliminary results indicate an increase in total numbers through each year. Coleoptera represent the dominant group for all wetlands at each site. Vegetation may be an early influence on the macroinvertebrate community development. *Typha* species have steadily increased and now dominate all wetlands, although there remains good species diversity. Ongoing analyses will compare species diversity and seek to determine if there are differences in abundance and diversity between sites, and examine the development of the macroinvertebrate community over time.

## **10. Physiological Fiber Types in Crayfish**

Zainab H. Alolaywi\*, Scott Medler, Ph.D., State University of New York at Fredonia,  
Department of Biology

Crustacean skeletal muscles share many basic characteristics with vertebrate skeletal muscles, but exhibit greater diversity in many respects. In crustaceans' muscles, fiber types are also specialized for diverse kinds of contraction, but the mechanisms used to generate these specializations are unique from vertebrates. My thesis research is focused on defining how multiple parameters interact to determine fiber types in crayfish abdominal muscles. The crayfish extensor of the abdominal muscles contains a variety of fiber types, with several being slow or tonic, while some being fast or phasic in their chemical and biological phenotypes. Additionally, the motor neurons, which innervate the muscles, exhibit differences in their functional features. I am using several different approaches to better understand these fiber types. First, I am recording resting membrane potentials in individual muscle fibers using intracellular electrodes. I have found that individual fibers exhibit a range of potentials, ranging from about -45 mV to -80 mV. I am also measuring sarcomere widths in different abdominal extensor muscles. Longer sarcomeres are characteristic of slower muscle contraction, while short sarcomeres are found in fast fibers. Like the membrane potentials I've measured, there are significant differences in sarcomere width, with the shortest sarcomeres being 3  $\mu\text{m}$  and the longest being 6  $\mu\text{m}$  or more. Finally, I am determining how different myosin isoforms are expressed in single muscle fibers. My long term goal is to determine how these different functional parameters correlate with one another to form unique fiber types.

## **11. The Relationship between cardiovascular system and skeletal muscle fibers in ghost crabs**

Siyan Yang\*, Scott Medler, Ph.D., State University of New York at Fredonia,  
Department of Biology

The ghost crab (*Ocypode quadrata*) is an invertebrate that exhibits remarkable running capabilities that rival those of vertebrates. Among terrestrial crabs, ghost crabs are especially aerobic runners. A large number of studies have reported various aspects of exercise physiology in ghost crabs, but none to date have examined the relationship between different skeletal muscle fiber types and the aerobic metabolism supported by the cardiovascular system. Our recent work demonstrates that ghost crab muscles are supplied by a well-developed circulatory system. It is mainly constitutive of a single chambered heart which is located inside the pericardial sinus, seven major arteries, smaller divided arteries, and capillary-like vessels with hemolymph flow inside. However, how directly blood is supplied to different muscle fiber types, and how the oxygen flux influences aerobic muscle fibers to subdivide are not yet known. In the current studies, I have been investigating the circulatory system by injecting two different materials into the arterial system. One is utilizing resin casts (Batson Monomer) to visualize the arterial supply to the muscles; the other is injecting fluorescent microspheres to track the flow of blood into the muscles. My long-term goal is to understand the mechanisms of arterial blood supply to skeletal muscle fiber types and their associated running abilities of ghost crabs.

## **12. Investigation of possible causes of winter fish kills in Kae Erie waters adjacent to Erie Coke**

Emma Mader\*, J. Michael Campbell, Mercyhurst University, Biology Department

Over two years (2017-2018), Gizzard shad (*Dorosoma cepedianum*) were observed at Erie's East Avenue Boat Launch, where Erie Coke discharges heated water to Lake Erie. Due to a die-off of the shad during the winter months, an investigation of the cause of fish death began. Potential causes of Gizzard shad mortality in Lake Erie include thermal shock, disease/parasites, oxygen depletion beneath ice, and chemical contaminants. The methodology included testing the nearby water quality and temperature, as well as dissection of dead shad collected at the site on January 19, 2017 and February 6, 2018. Necropsies produced no evidence of the presence of disease-causing parasites that are known to kill Gizzard shad in Lake Erie. Lack of ice cover in the areas where the die-offs occurred and behavior of *D. cepedianum* were not consistent with winterkill due to oxygen depletion. We suspect that the fish were attracted to the site by warm water released from Erie Coke, and that thermal shock and/or chemical contaminants discharged to Lake Erie by Erie Coke are responsible for the die-offs. The likelihood of releases from Erie Coke via groundwater of toxins such as benzene, naphthalene, polycyclic aromatic hydrocarbons (PAHs) and arsenic lead to the hypothesis that a combination of thermal and chemical pollution from Erie Coke is responsible for the gizzard shad mortality, and will be the subject of future research.

## **13. Ephemeral life, a comparison of invertebrates found in several types of pools**

Morgan Eytcheson\*, Holly Travis, Ph.D., Indiana University of Pennsylvania

Vernal pools are temporary pools that form after rainfall. Due to their ephemeral nature, they may be a habitat for unique animals that might not otherwise thrive in longer lasting bodies of water. Animals living within these pools also have the potential to tell us about the health of the pool and the ecosystem around it. In order to test this idea, we placed leaf packs made of leaves found around each site into a vernal pool that dries up periodically, a forest pool that does not dry, and a small slow-moving flow of abandoned mine drainage (n=3 per treatment, per collection). Each water source had 3 points into which the packs were placed. The invertebrate life from these packs is to be collected, counted, and identified to family level in order to compare life within each site. Results we've collected so far will be presented. Over time additional packs will be collected and placed out to view changes within the sites as time and seasons progress.

## **14. Fair Weather Friends, The Populations of Vernal Pools**

Allison Crowell\*, Holly Travis, Ph.D., Indiana University of Pennsylvania, Department of Biology

Natural vernal pools are an area of limited study. Through observations of 4 different vernal pools, I will compare the populations of diatoms, macroinvertebrates and pool chemistry. Two of the pools are forest pools and the other two are natural vernal pools. I plan to see if there is a clear correlation between the populations of macroinvertebrates and diatoms found in the pools. Also, I will determine how the populations and water chemistry changes throughout the seasons between the two types of pools. This data will be a starting point for continued research on vernal pools and diatoms.

## **15. Effect of male desertion on provisioning, growth, and survival of Hooded Warbler nestlings**

William D. Harrod\* and Ronald L. Mumme, Allegheny College, Department of Biology

Parental care and molt are two extremely taxing parts of the avian lifecycle. Trade-offs between these two phases occur frequently. The Hooded Warbler (*Setophaga citrina*) experiences these trade-offs heavily and males have been known to desert their mate and their offspring during molt. However, it is unknown how females and young react to male desertion. We examined how male desertion affects nestling provisioning rate, growth rate, and survival in a color banded population of Hooded Warblers in northwestern Pennsylvania. Our hypothesis was that females would be able to increase provisioning rate and compensate for the lack of a male. Provisioning data was obtained from 19 late-season nest which were observed from either a blind or a video camera. Nestling growth data was obtained from 14 late-



season nests where nestlings were weighed every 2-3 days until they reached day 5. Nestling survival data was obtained from 21 late-season nests 2013-2017. In nests where males deserted, females were able to significantly increase the rate at which they provisioned young. Nestling growth rate and survival were both similar between deserted and deserted nests. Our hypothesis was supported. Male desertion had very little effect on the health of nestlings because females were able to compensate and effectively provision young.

#### **16. Differences in Infections of Pennsylvania Ruffed Grouse (*Bonasa umbellus*) with *Ascarida* and *Heterakis***

Nicole Simonetti\*, Michal Szelwach\*, Edward Phillips, Gannon University, Department of Biology

Ruffed grouse (*Bonasa umbellus*) were collected from 21 counties in Pennsylvania during the last four hunting seasons. Necropsies were performed on the intestines and ceca of the grouse to remove parasitic nematodes. Two species of nematodes were identified (not all specimens were identified to species), *Ascarida bonasae* from the intestines and *Heterakis isolonche* from the cecum. The % of birds infected and the mean infection per infected bird of both species of nematode were analyzed in all birds combined, by year, and by age and sex of the bird. Overall infection rates with *Ascarida* dropped during each of the first three seasons from 64.7% to 53.7% to 30.9%, then increased to 54.8% during the 2017 season. Individual mean infections with *Ascarida* also dropped each season from 4.6 to 3.1 to 0.8 during the first three seasons, then increased to 2.6 worms per bird during the 2017 season. The drop to 0.8 during the 2016-17 season was significantly different from the two previous seasons and from the 2017 season. The infection rates and mean individual infection of *Heterakis* remained relatively constant through-out all four seasons. During 2017, and for all four seasons combined, juvenile grouse had significantly greater mean infections of both *Ascarida* and *Heterakis* than did adult grouse. There were no significant differences between the sexes.

#### **17. Does the Scent of a Large Predator Reduce Predation of Nests of the Hooded Warbler?**

Brianna Kunes\*, Ron L. Mumme, Allegheny College

Forest fragmentation and the introduction of foreign species has forcibly increased encounters between birds and their predators. As a result, avian mortality rates have increased while reproductive success has decreased. This situation is increasingly problematic for endangered or threatened species. This study explores one possible method to reduce nest predation in the hooded warbler. Birds and small mammals, such as chipmunks, are common nest predators of the hooded warbler. Previous studies suggest that small mammals can detect and avoid the scent of their larger predators. Therefore, we dispersed coyote urine around hooded warbler nests during their period of incubation to test the hypothesis that the scent of this large predator may ward off smaller nest predators and reduce nest predation. Additionally, we observed potential changes in parental care by recording the duration of incubation bouts by the female warbler. Our results suggest that chemical cues may be successful at reducing nest predation by small mammals. This trend was not obvious until later in the nesting season when egg-laying by the brood parasitic brown-headed cowbird ended. The cowbirds' "mafia-like" behavior may have masked differences in survival between control and experimental conditions early in the season. Further, we observed no significant differences in parental behavior between conditions, suggesting the birds were unable to detect the coyote urine. Predator simulation via chemical cues may be a successful and natural means of avian conservation and should be studied in other species before large-scale implementation.

#### **18. Impact of climate on recruitment of Whitebark Pine (*Pinus albicaulis*) and Lodgepole Pine (*Pinus contorta* ssp. *Murrayana*) in South Lake Tahoe.**

Katherine Reisinger\* Christopher Dolance, Ph.D., Mercyhurst University

Studying the relationship between climate and tree recruitment is essential in understanding the factors that drive successful recruitment. By knowing these factors, it allows scientists to create, predict, and draw conclusions about the future recruitment of trees with climate change. In the warm and temperate

climate of South Lake Tahoe, averages of 288 inches of snow per year make it the ideal habitat for some subalpine tree species. We analyzed the relationship between climate and recruitment years of two species: whitebark pine (*Pinus albicaulis*) and lodgepole pine (*Pinus contorta* ssp. *Murrayana*). Monthly climate data that displays minimum temperatures, maximum temperatures, observed temperatures, and precipitation were accessed from NCDC's Climate Data Online (CDO) at the South Lake Tahoe Airport weather station. Pith dates for the two species were recorded from cores taken from the Heavenly ski run. Forty-four tree cores have been dated ranging from 1729 to 1927. A minimum of 50 additional cores will be dated and added to the dataset. Preliminary data suggest the pith dates are correlated with cool and wet conditions, but further analysis is needed to draw a conclusion. Ongoing drought and climate change have led to increases in mortality across the Sierra Nevada Region, and changes in forest composition are predicted as a result. Based on the trends discovered in this study, if temperatures continue to increase and precipitation decrease, then it will be difficult for these species to have successful recruitment.

## 19. Climate Change in North East, Pennsylvania

Kara Dobson\*<sup>1,2</sup>, Michael Campbell<sup>1,2</sup>, Lynne Beaty<sup>1</sup>, Bryan Hed<sup>2</sup>

<sup>1</sup>Penn State Erie, The Behrend College, School of Science

<sup>2</sup>Lake Erie Regional Grape Research and Extension Center, Penn State College of Agriculture

The North East region of Erie County, Pennsylvania lies along the southern coast of Lake Erie. This area has a unique microclimate due to its proximity to the lake, which allows for the production of grapes. Climate data dating back to 1948 was found at the Lake Erie Regional Grape Research and Extension Center, which resides in North East. This data contains daily maximum and minimum temperatures, as well as other factors such as precipitation rates and phenological events for grapes. This data was used to determine how the climate has changed in this region over the last 70 years. The results show that winter is becoming shorter, with the first frost date starting later and the last frost date ending earlier each year. Also shown is the total number of Growing Degree Days (GDD) increasing for each year, indicating warmer temperatures occurring more frequently, as well as bloom dates for grapes beginning earlier with each year. Further analyzations of changes in grape size, brix level, and precipitation rates are currently being conducted.

## 20. The Effect of Potential Confounding Variables on the Detection of *Borrelia burgdorferi* in *Ixodes scapularis* ticks

Robert Waters, M.S.\*, Nancy Carty, Ph.D., Christopher Keller, Ph.D.

Lake Erie College of Osteopathic Medicine, Laboratory of Human Pathogens

**Introduction:** *Ixodes scapularis* ticks are the vector for transmission of *Borrelia burgdorferi*, the causative agent of Lyme disease (LD). In Erie County, the incidence of LD has increased by 300%. In this study we examined the effects of decapitation during tick removal, desiccation, and engorgement on detecting *B. burgdorferi* DNA. This study also examined different ways to reduce the time of the current protocol.

**Methods:** For each tick tested, presence of tick and *B. burgdorferi* DNA was determined with specific PCRs. The effect of desiccation was tested by drying ticks for varying times. To test if *B. burgdorferi* is detectable in decapitated ticks, the head and torso were separated and tested individually. Engorged ticks were tested by cutting the torso and draining the blood before washing. Lastly, the protocol was shortened by reducing the incubation and freeze time.

**Results:** All variables tested displayed tick DNA except for the heads. *B. burgdorferi* was detectable after desiccation. Following decapitation, *B. burgdorferi* was detected in all tick torsos, but only one head. *B. burgdorferi* was visualized in engorged ticks. The shortened protocol successfully isolated *B. burgdorferi* DNA.

**Conclusion:** *B. burgdorferi* DNA was detected in desiccated, decapitated, and engorged ticks, thus ticks received in a variety of conditions can be analyzed for the presence of *B. burgdorferi*. In addition, by reducing the protocol time, we can report PCR results in a single day. These findings will allow us to possibly accept ticks from the public or healthcare professionals for detection of *B. burgdorferi* DNA.

## **21. Molecular Epidemiology Investigation of *Borrelia burgdorferi* in *Ixodes scapularis* Ticks Collected from Erie County**

Shauni Bobbs\*, Nancy Carty, Ph.D., Christopher Keller, Ph.D., FNAOME  
Lake Erie College of Osteopathic Medicine, Laboratory of Human Pathogens

*Ixodes scapularis* ticks are the primary vector in transmission of *Borrelia burgdorferi*, the causative agent of Lyme disease (LD). Within the last 10 years, Erie County, PA has seen a dramatic increase in LD cases. The purpose of this study was to observe if fabric (or clothing) weight influences attachment of questing ticks on Presque Isle State Park (PISP). In addition, we determined the percentage of *B. burgdorferi*-positive nymph ticks collected on PISP during Summer 2017 and adult ticks collected at various Erie County locations (including PISP) during Fall 2017.

*I. scapularis* ticks were collected from PISP using heavy, medium, and light weight fabrics. PCR was used to determine the percentage of *B. burgdorferi*-positive ticks collected at three Erie County locations (PISP, Erie Bluffs State Park (EB), and Zuck Park (ZP)).

Ticks (n=208) were captured using each fabric. Although more ticks were collected with heavy fabric, the difference was not significant. During Summer 2017, 35% (29/82) of nymph ticks collected were *B. burgdorferi*-positive, and 34% (83/245) of adult ticks collected in Fall 2017 were positive. There was no significant difference between the percentage of *B. burgdorferi*-positive ticks between Summer and Fall nor PISP relative to EB and ZP during Fall.

Results from this study suggest that clothing weight will not influence *I. scapularis* tick attachment. Because the percentage of *B. burgdorferi*-positive ticks found during Summer and Fall 2017 did not differ among season or Erie County location, this study also suggests that season nor location impacts *B. burgdorferi* carriage rate.

## **22. Incidence of *Borrelia burgdorferi* in blacklegged ticks (*Ixodes scapularis*) collected from white tailed deer (*Odocoileus virginianus*) at Presque Isle State Park.**

Rachel N. Gongaware, Cori Dowell, Caitlyn Washburn and Fred J. Brenner\*, Biology  
Department Grove City College, Grove City College

The blacklegged tick also known as the deer tick were collected from deer harvested by hunters during the 2015 and 2016 special season at Presque Isle State Park. Preliminary results to date indicated that incidence of *Borrelia burgdorferi* was 50 percent in adult females and 23 percent in adult males. Only 20 % females tested negative for *Borrelia burgdorferi* compared to 80 percent of the males. All the ticks collected during the 2015 and 2016 special hunting season are currently being analyzed for *Borrelia burgdorferi* and additional ticks will be collected during the 2018, 2019 and 2020 hunting season.

## **23. The Impact of Maternal Inflammatory Responses on Structure and Function of the Cerebellum**

Syed Ahmed, M.S.\*<sup>1</sup>, Kaitlyn Blackburn, D.O.<sup>2</sup>, Randy Kulesza, Ph.D.<sup>1</sup>

<sup>1</sup>Lake Erie College of Osteopathic Medicine

<sup>2</sup>UPMC Hamot, Department of Neurology

Autism spectrum disorder (ASD) is a neurodevelopmental disorder characterized by deficits in verbal and nonverbal communication, motor coordination, and restricted and repetitive behaviors. While still largely



considered idiopathic in nature, the cause of ASD has been linked to genetic and environmental factors. Inflammatory responses during pregnancy have been linked to ASD in addition to various neurodegenerative disorders. Lipopolysaccharide (LPS), a component of gram negative bacterial cell walls, can be used to induce an inflammatory response. In this study, pregnant rats were exposed to a repeated dose of LPS on embryonic days 8, 10, and 12. Then we used behavioral tests and investigated the structure and function of the cerebellar vermis to identify if ASD-like deficits were induced in male offspring. Rats exposed to inflammation performed significantly worse in the accelerating rotarod motor task. Morphological analysis revealed that Purkinje cells were significantly smaller in multiple lobules of the cerebellum and the expression of the calcium binding protein calbindin was reduced in lobules VIII and IX. Dysplasia and ectopic neurons were also observed. These results suggest that repeated embryonic exposure to LPS-induced maternal inflammation induces cerebellar dysmorphology and dysfunction.

#### **24. Connections between the Basal Forebrain, Lateral Mediodorsal Thalamic Nucleus and the Septum in Macaque Monkey**

Alayna Earp\*, Darlene Melchitzky, M.S., Mercyhurst University

While the lateral mediodorsal thalamic nucleus (LMD) is well known for higher-order cognitive functions, recent studies infer that the basal forebrain (BF) and septum are also involved in cognition, specifically attention and memory. This may suggest a shared circuitry between these three specific areas. The goal of this study is to examine the possible projections from the BF and septal areas to the LMD. In a previous study, cynomolgus monkeys (*Macaca fascicularis*) were injected in the LMD with the retrograde tracers Cholera Toxin Subunit B, and the slides from two of these cases were evaluated for the number of labeled neurons in the BF and septum. Initial analysis revealed labeled cells in numerous BF regions such as the basal nucleus of Meynert and septal areas including the lateral septal nucleus. The most rostral injection site (Case 228) provided a great amount of cells in both the BF and septum. Interestingly, an injection site in the ventral anterior nucleus (VA) opposed to the LMD (Case 227) presented fewer labeled cells in all areas studied. These findings suggest that projections from the BF and septum to the LMD, but not the VA, are topographically organized and the BF and septal afferents to the LMD may serve as a transthalamic circuit connecting the BF, septum and prefrontal cortex.

#### **25. The Role of SCAMP3 in Beta-Amyloid Production and Secretion**

Maura Mobilia\*, Jeremy Santarelli, Daniel Cooney, Quyen Aoh, Ph.D., Gannon University

Alzheimer's disease is a neurodegenerative disease associated with loss of memory and cognitive function. The aggregation of extracellular plaques containing  $\beta$ -amyloid is related to the processing of the amyloid precursor protein (APP). The degradation of APP is regulated by the endosomal sorting complexes required for transport (ESCRTs) and disruption of ESCRT function leads to accumulation of  $\beta$ -amyloid. Previous studies have shown that secretory carrier membrane protein 3 (SCAMP3) interacts with ESCRTs that function in APP processing. We hypothesize then that SCAMP3 functions in trafficking of APP. In this study we use a well-established ELISA assay to determine if RNAi-induced knockdown of SCAMP3 promotes or inhibits  $\beta$ -amyloid production.

#### **26. The Role of SCAMP3 in CXCR4 trafficking**

Kasie Inerra\*, Jordyn Buchanan, Quyen Aoh, Ph.D., Gannon University

The CXC-Chemokine Receptor Type 4, CXCR4 is a G-protein coupled receptor that regulates cell growth and division, differentiation, and migration. Overexpression of CXCR4 has been linked to metastasis in cancer and promotes HIV infection. Decreased trafficking of CXCR4 to the lysosome can promote its overexpression. Upon binding to its ligand, CXCL12, CXCR4 is endocytosed. At the early endosomes, CXCR4 is ubiquitinated by the ubiquitin ligase Itch and then sorted into multivesicular bodies by the ubiquitin adaptor proteins Hrs and Tsg101. It is then targeted for degradation in the lysosomes. We are interested in whether Secretory Carrier Membrane Protein (SCAMP) 3, which is known to interact with Hrs and Tsg101, also regulates CXCR4 trafficking. To test whether SCAMP3 regulates CXCR4

trafficking to the lysosome, we will use RNA interference to knockdown SCAMP3 and we will then monitor CXCR4's localization relative to markers of the early endosome and lysosomes. We have optimized the immunofluorescence assay to examine CXCR4 localization. We have found that staining for the lysosomes and early endosomes independently of CXCR4 reduces non-specific cross-reactivity between the antibodies and increases labeling specificity. Also, permeabilizing the cells before fixing them increases specific labeling of CXCR4. Our next step will now be to perform the immunofluorescence assay in the presence or absence of SCAMP3 to determine the role of SCAMP3 in CXCR4 trafficking.

## **27. The Role of Secretory Carrier Membrane Protein 3 (SCAMP3) in Localization of the Amyloid Precursor Protein**

Joseph Lueck\*, Quyen Aoh, Ph.D., Gannon University

Neurodegenerative amyloid diseases, such as Alzheimer's disease, accumulate extracellular aggregates of the protein  $\beta$ -amyloid. The amyloid precursor protein (APP) is a larger protein that can be cleaved into  $\beta$ -amyloid and an intracellular domain. The endosomal sorting complexes required for transport (ESCRTs) regulate endosomal transport of APP to the lysosome, therefore regulating degradation of APP. Thus, defects that inhibit ESCRT function lead to decreased transport of APP to the lysosome, which in turn results in increased  $\beta$ -amyloid production. Previous studies have shown that Secretory Carrier Membrane Protein 3 (SCAMP3) interacts with ESCRTs and has been found to be colocalized with the major organelles involved in APP trafficking. Therefore, we hypothesize SCAMP3 affects the trafficking of APP within the cell, due to its interactions with ESCRTs and the essential organelles in the APP trafficking and breakdown process. Based on this, SCAMP3 may also regulate APP localization in the lysosome. In this study, we will use an immunofluorescence assay to determine if knockdown of SCAMP3 promotes or inhibits transport of APP to the lysosome.

## **28. Estimated Cancer Risks from Exposure to Hazardous Air Pollutants in Erie County, PA**

Priyank Shakya\*, Christopher Magno, Ph.D., Michelle Homan, Ph.D., Gannon University

Hazardous Air Pollutants (HAPs) are a category of 187 toxic air pollutants recognized by the U.S. Environmental Protection Agency (EPA) as known or suspected carcinogens. Most of the air toxics are emitted from anthropogenic sources such as factories, refineries, and vehicle. Certain sociodemographics factors may explain increased risks in certain communities due to living close to emission sources. The goal of this project is to compare EPA's National Airborne Toxics Assessment (NATA) from 2014 with that of 2011. NATA includes estimates of HAPs concentration by census tract along with the associated cancer risks. The results of this project were determined by mapping, using Arc GIS software, and the analysis feature within the software. The top cancer drivers within Erie County in 2014 were formaldehyde, carbon tetrachloride, benzene, and acetaldehyde. The results show that there is considerable variability across Erie County with the city of Erie having higher estimated cancer risks. However, the 2014 NATA suggests that the total lifetime cancer risk has decreased more than 30-fold compared to 2011 estimates.

## **29. Examination of Isolated Compounds from Bee Balm (*Monarda didyma*) as a Potential Treatment for Tumor Angiogenesis**

Kimberly A. Pintabona\*, Blake L. Podger\*, Matthew J. Foradori, Edinboro University of Pennsylvania

Angiogenesis is defined as the formation of new blood vessels. Although normal physiological systems undergo this process, angiogenesis is also one of the main hallmarks of tumor growth. Without a blood supply, cancerous tumors are typically limited in size and growth rate. The formation of new blood vessels grants cancerous tumors the ability to thrive and grow exponentially. To cut off the ability for a tumor to undergo angiogenesis would mean depleting it of necessary nutrients in order to survive, and thereby disrupting the ability of the tumor to grow and spread via metastasis. One of the mechanisms that

can control angiogenesis is a family of molecules known as angiogenic inhibitors. Bee Balm is known for having medicinal properties such as being a stimulant, carminative, and a rubefacient. Our research looks for the possible presence of angiogenic inhibitors in Bee Balm leaves and stems. After initial plant homogenation and compound extraction, four milliliters of dialyzed Bee Balm concentrate was fractionated using a Bio-Rad EG-1 Econo Gradient Pump with a Bio-Scale Mini UNOsphere Q sepharose column. These fractions were then introduced to bovine aortic endothelial cells (which line the inside of blood vessels) to assess their ability to inhibit proliferation and migration.

### **30. Regulation of dihydrofolate reductase (DHFR) gene expression in human breast tissue cell lines**

Parmvir Deo\*, Gary M. Vanderlaan, Meghan G. Robick, Prasad S. Dalvi, Gannon University, Biology Department

The dihydrofolate reductase gene (*Dhfr*) is an E2F1-regulated proto-oncogene. Dhfr is critically important in the anabolism of both sulfur-containing amino acids and certain nitrogenous bases. Perhaps its most notable role however is for the synthesis of deoxyribose thymidine triphosphate (dTTP), a requisite building material to sustain elevated DNA replication rates in cancer cells. Previous work has established that expression at the *Dhfr* locus is under the combined control of at least five distinct mechanisms. At the transcriptional-level, E2F1 binding sites located in the promoter of the *Dhfr* gene place it under direct control via the E2F family of specific transcription factors that regulate the cell cycle. Further, a non-coding RNA (*ncRNA-Dhfr*) expressed from a nearby minor promoter destabilizes assembly of general transcription factors, TBP and TFIIB, during transcriptional initiation at the *Dhfr* major promoter. Lastly, the DHFR enzyme itself has been shown to interfere with translational machinery, and two different microRNAs (miR-24 & miR-192) appear to regulate *Dhfr* mRNA stability putatively in a RISC-mediated mechanism. Each means of regulation has been documented in an equally disparate array of cancer cell lines, ranging from leukemia, osteosarcoma, fibrosarcoma, and colonosarcoma. Here we seek to investigate human *Dhfr* regulation in both non-tumorigenic breast epithelial cells (MCF10A) and a breast cancer cell line (MCF-7) by analyzing the levels of 1) *Dhfr*, 2) *E2f1*, and 3) *ncRNA-Dhfr* transcription via RT-PCR assays of isolated total RNA derived from cell-culture lysates. Future experiments may investigate the RISC-mediated mRNA degradation in these two human breast cell lines.

### **31. The Effect of Silver Ions on the Bacterial Composition with Local Streams**

Tyler Hostetler\*, Beth Potter, Penn State Behrend, Biology Department

Our society has become more aware of the abundance of bacteria which is evident by the increase in antimicrobial products over the past two decades. A commonly used agent in many antimicrobial products is silver ions due to its multifactorial approach to killing a wide range of microorganisms. Most of the research concerning silver ions has focused on its antimicrobial effectiveness and considerably less research has been done on any effect of the over-usage of silver in the environment. Thus, the goal of our study is to determine whether silver is affecting bacterial ecosystems within our local waterways. For the study, collections from surrounding streams will be exposed to coupons either coated with silver zeolite or a non-silver coating. After 48 hours of exposure, the samples will be transferred to a filter through vacuum filtration and the filters were placed on all purpose agar, selective and differential agar, and more specific chromogenic agar. Samples will also be analyzed for differences using culture-independent techniques. The goal is to determine whether there is a difference in the growth of bacterial colonies after exposure to silver or not.

### **32. The Effect of Carvacrol and Thymol on Growth Inhibition of *Staphylococcus aureus* and *Pseudomonas aeruginosa***

Don Jude Jayamaha\*, Robert Waters, M.S., Erika Allen, Ph.D., Nancy Carty, Ph.D., Kyle Scully, Ph.D., and Christopher Keller, Ph.D., FNAOME

Lake Erie College of Osteopathic Medicine, Laboratory of Human Pathogens

**Introduction:** Gram-positive *Staphylococcus aureus* and gram-negative *Pseudomonas aeruginosa* are pathogens responsible for numerous bacterial infections. The rising rates of infections caused by antibiotic resistant strains of these bacteria have necessitated development of novel therapeutic approaches. Our previous research found that oregano oil (OO) and red thyme oil (RTO) are two of the most effective oils against *S. aureus*, and also effective against *P. aeruginosa*. The goal of this study was to determine the effects of carvacrol and thymol, the two major components of OO and RTO respectively, on *S. aureus* and *P. aeruginosa* growth inhibition.

**Methods:** The Kirby-Bauer disc diffusion method was used to determine the zone of inhibition (ZOI) of carvacrol and thymol individually against three strains of *S. aureus* and three strains of *P. aeruginosa*. ZOIs for dilutions of carvacrol and thymol were acquired and then compared to the ZOIs obtained for OO and RTO. Carvacrol and thymol were then combined to observe possible synergistic interactions, and ZOIs were determined and compared to the ZOIs of OO and RTO.

**Results:** In general, dilutions of carvacrol and thymol produced larger ZOIs for *S. aureus* relative to *P. aeruginosa*. For *S. aureus*, it was discovered that RTO was significantly larger than 25% carvacrol and trended higher than the other dilutions of carvacrol and RTO was significantly larger than the highest concentration of thymol. For *P. aeruginosa*, it was discovered that RTO was significantly larger than OO and all the concentrations of carvacrol and thymol. The combination of carvacrol and thymol was as effective as OO and RTO in growth inhibition of *S. aureus* and *P. aeruginosa* growth.

**Conclusion:** Although carvacrol and thymol did have antimicrobial effects against *S. aureus* and *P. aeruginosa*, neither was as effective as the OO and RTO, respectively, and there was no synergistic activity between these components. Since RTO was the most effective at inhibiting bacterial growth in the present study, it may be advantageous to explore the therapeutic potential from combinatory approaches involving RTO and other oils or their components.

### **33. The Role of *trans*-Golgi Network and Endosomal Adaptors in Nitrogen-Regulated Growth of *Saccharomyces cerevisiae***

Allyson Owens\*, Gannon University

Cell membrane trafficking is the transportation of vital cellular materials, such as nutrients, waste products, and proteins between the plasma membrane and organelles. Membrane trafficking is facilitated by a host of proteins that concentrate cargo and mediate vesicle formation. The ability to correctly regulate membrane trafficking under different environment conditions is essential for cell growth. In this proposal, the role of trafficking in regulating cell growth under different nitrogen conditions is examined using the yeast *Saccharomyces cerevisiae*. Specifically, we determined how clathrin adaptors that function at the *trans*-Golgi Network (TGN) and endosomes regulate cell growth in preferred and non-preferred nitrogen sources. We used spectrophotometry to measure the growth of mutant yeast with various deletions of clathrin adaptors. The results of this study adds to a growing body of knowledge of how clathrin adaptors affect the overall fitness of the cell and may reveal how membrane traffic is differentially regulated depending on environmental conditions.

### **34. Cryptolepine Action on Insulin Resistance in High-Glucose Diet-fed *Caenorhabditis elegans***

Ryan C. Young\*, Prasad S. Dalvi, Gannon University, Biology Department

Cryptolepine, a pharmacologically active plant alkaloid, is isolated from the roots of the shrub *Cryptolepis sanguinolenta* commonly found in the Central and Western regions of the African continent.

Cryptolepine exhibits significant potential as an anti-malarial, anti-bacterial, anti-inflammatory and anti-hyperglycemic agent under different *in vitro* and *in vivo* conditions. At present, relatively few studies on the effects of cryptolepine on development of insulin resistance, a pre-diabetic condition, have been reported. High-glucose diets (HGD) cause a rapid increase in blood glucose level and alter glucose homeostasis by inducing insulin resistance in organisms as diverse as yeasts, worms, and mammals. In the present study, we hypothesize that cryptolepine will prevent development of insulin resistance by its anti-inflammatory action in HGD-fed *Caenorhabditis elegans* (*C. elegans*) worms. To test the hypothesis, we will examine the modulation of insulin resistance and oxidative-stress induction and associated regulatory mechanisms by cryptolepine in HGD-fed *C. elegans*. Initially, we will investigate fat accumulation and survival (development, fertility and lifespan) in three types of *C. elegans*: wild-type worms, HGD-fed high-fat worms cultured in nematode growth medium containing 10 mM glucose and *C. elegans daf-2* insulin/insulin-like growth factor 1 (IGF-1) receptor mutant worms in which metabolism is shifted towards fat accumulation. Next, we will determine the expression of various genes involved in development of insulin resistance and oxidative-stress induction in these worms. Finally, we will treat all three types of *C. elegans* with cryptolepine to investigate whether it prevents fat accumulation and rescues the worms from insulin resistance and oxidative stress.

### **35. Impact of Stimuli on Fatigue**

Travis Briggs\*, Todd Backes, State University of New York at Fredonia

Muscle fatigue is defined as the decline in ability to produce an expected force output from muscle. There are two theories that describe this process, muscular fatigue is most likely a multifaceted physiological response that incorporates both theories. Peripheral Fatigue is one of the potential mechanism for musculoskeletal fatigue and can be split into two categories, the accumulation of metabolic byproducts, or the depletion of metabolic fuels. On the contrary side is Central Fatigue (CF), which is hypothesized to be the decrease in the CNS drive to initiate musculoskeletal contractions. The Central Govern Model (CGM) is a proposed theory to help explain this decrease in CNS drive. This model describes fatigue that has the brain and spinal cord being a safety mechanism that preserves homeostasis and prevents physiological failure or injury. The aim of this research is targeted toward examining neuronal oxygen metabolism and muscle contraction alterations during a hand grip exercise in the presence of different visual stimuli. Each subject was seated with EMG electrodes placed on the skin at specific muscle activation recording landmarks, and NIRS optical fibers placed on the subjects' motor cortex. Subjects repetitively squeezed a hand grip resistor 10 times followed by an immediate handgrip force measurement on the Jamar hand dynamometer. This exercise was continued until force output fell below 30% of their 1RM. While the exercise stayed consistent, the stimulus presented to the participant during the protocol changed for each of the 3 trials. Near Infrared Spectrophotometer (NIRS), allowed for non-invasive monitoring of the motor cortex oxygenation levels. This procedure allowed us to observe the oxyhemoglobin and deoxyhemoglobin levels in the motor cortex during exercise. By observing these biomarkers, the rate of oxygen metabolism can be assessed. By presenting the subjects with different visual stimuli, it was predicted that there would be changes in oxygen metabolism and thus the rate of fatigue. Observing the changes in oxygen metabolism during exercise could contribute to the knowledge on fatigue mechanisms by giving insight on the physiological changes in the motor cortex of fatiguing individuals. We will analyze changes in force production and EMG amplitude in both within and between conditions.